Science Issues for Community Leaders

Center for Health, Environment & Justice
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Mentoring a Movement

Empowering People

Preventing Harm

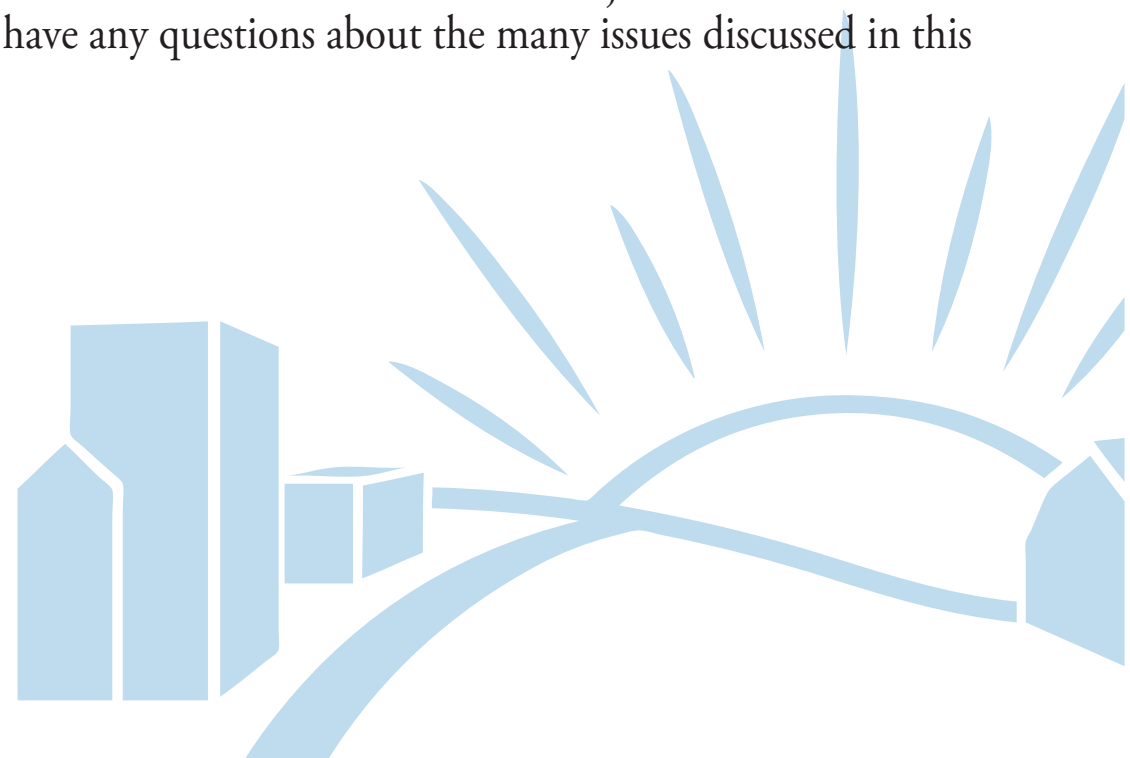
About the Center for Health, Environment & Justice

CHEJ mentors the movement to build healthier communities by empowering people to prevent the harm caused by chemical and toxic threats. We accomplish our work by connecting local community groups to national initiatives and corporate campaigns. CHEJ works with communities to empower groups by providing the tools, strategic vision, and encouragement they need to advocate for human health and the prevention of harm.

Following her successful effort to prevent further harm for families living in contaminated Love Canal, Lois Gibbs founded CHEJ in 1981 to continue the journey. To date, CHEJ has assisted over 10,000 groups nationwide. Details on CHEJ's efforts to help families and communities prevent harm can be found on www.chej.org.

Introduction

One of the more frustrating problems for someone new to the issues raised by exposures to toxic chemicals is the jargon of the technical language used to describe the issues. Scientists and engineers have a language all their own and for any newcomer, this language and the concepts it explains can sometimes be as intimidating as the polluter generating the chemicals that people are exposure to. To address this problem and to take some of the mystery out of the scientific jargon, CHEJ ran a regular feature in our quarterly newsletter, *Everyone's Backyard* that addressed different scientific and engineering issues. The primary author for these articles was Stephen Lester, CHEJ's Science Director. In some cases, guest authors contributed articles. In those cases, we've identified the contributing author. The idea was to explain in simple terms common scientific issues and concepts that come up in discussing the impacts of exposures to toxic chemicals. We've selected from among the best of these articles and edited them for consistency and readability. We hope you find them helpful as you address various scientific issues in your efforts to achieve environmental justice. Don't hesitate to contact us if you have any questions about the many issues discussed in this guidebook.



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Chapter 1

Using Science and Scientific Information to Evaluate Health Problems in Communities

Science Lessons for Community Leaders

It is common to think that in science and technical information lies the answer to the many questions that people have about their problems and how to solve them. At CHEJ, we have not found this to be the case. We have learned many lessons about science and how it is used in the real world. Science and technical information is important and has a role in helping to achieve your community goals. Identifying this role and learning how to use scientific and technical information is critical to the success of your group.

The most important lesson is that science and technical information alone will not solve problems. It's a common mistake to think that if you hire the best scientists and engineers and make solid technical arguments, the government decision-makers can be convinced you're right. Those of you who have been there know it just doesn't work that way.

When the government discovers a problem, it is very reluctant to determine the full extent of the problem. The reason for this is that if the government documents contamination that threatens people's health, it then has to do something about it—maybe evacuate people and clean up the contamination. These steps cost money the government doesn't want to spend. Such action might also set a precedent establishing cleanup standards or unsafe exposures levels that would mean spending more money at other sites. Scientific data and information play a small role in decisions. Political and economic considerations are far more important.

One reason for the low priority given scientific information brings us to Lesson #2 – there are only a few answers to the many scientific questions raise by exposures to toxic chemicals. Scientists actually know little about the health effects of exposure to combinations of chemicals at low levels. As a result, when politicians and bureaucrats look for answers, the scientists don't have them.

Lesson #3 is that scientists rarely admit they don't know the answer to a question. Instead they introduce the concept of "risk" and begin a debate over what's "acceptable." This is best illustrated when small amounts of chemicals are

found in drinking water. The government's response is usually to minimize the results, stating that the levels are very low and within "acceptable" limits. The real issue here is that scientists don't know what happens to people when they are exposed to low levels of a mixture of toxic chemicals, especially when one or several are carcinogens. This uncertainty gets lost in the use of "acceptable" limits, which are more opinion than fact.

The most difficult lesson to learn is that scientists are not objective. Scientists have their biases like everybody else. One of the great myths of our society is that science is pure and objective. While this may be true in the lab, it just isn't so when science is applied in community settings. In the lab, scientists have control over their experiments and there's no immediate social impact when they report their results. This control is lost in the real world, where uncertainties and incomplete information force scientists to make judgments and give opinions that have considerable political and economic consequences. Consequently, scientists are pressured by politicians and corporations with economic stakes in the outcome to make the "right decision" which is to protect their interests and not the public good. These pressures often make decisions very difficult, especially when there are so many uncertainties. Many good scientists have given in to the pressures brought on by controversy and threatened job security.

Science and technology have failed to provide clear answers and solutions to the hard questions about the health and environmental impact of the chemicals we use. But we cannot abandon science. We need to learn what it can tell us and what it can't. We need to recognize the role that science plays in public policy setting. Lesson #5 is that we need to recognize that most bureaucrats and politicians use science to justify their decisions which are based, not on the facts, but on the political and economic pressures they face.

Whether this is right or not is not a scientific question but an ethical and moral question. It is foolhardy to think that in this setting, science can be anything but a tool used by politicians and corporations to get what they want.

Lesson #6 is that science can be a powerful tool for community groups, but only if you recognize what it can tell you, what it can't, and only if you learn how to use the information and not just collect it. The right information used in the right way at the right time can be very powerful. Learning how to use scientific and technical information is an organizing skill.

Most of us have learned these and other lessons the hard way, with frustration, under stress and by the seat of our pants. Science and scientists are being demystified, and people are recognizing the limits of science and learning how to use technical information to make more informed decisions about their lives. As we look toward the future, I'm optimistic that the lessons learning over the years are making people less intimidated by science, more knowledgeable on scientific issues, and better able to interpret and use scientific and technical information to help answer their questions and achieve their goals.

Corollaries about science in public policy settings

- Experts are not always right.
- Experts can't solve your problems.
- Residents quickly become experts themselves; no one knows more about a community and situation than the people directly affected.
- Never let experts speak publicly in place on you. Do your own talking.
- Trust your instincts; rarely will you go wrong if you follow what you know in your heart to be true and right.

The Use of Science in Government—Don't Bother Me with the Facts

CHEJ gets many calls from people who are seeking information that they think will convince their state or local officials to take action. When people first get involved in toxic problems, it's normal for them to think that government is there to help them and that once the government understands what's going on in their community, it will do the right thing to correct the situation.

So many people try to get their state and local officials the "facts", thinking that if you give a reasonable and honest person enough evidence and information on health problems or contamination, that person will be convinced that there is a problem that must be dealt with.

Most people, including myself, found out the hard way that life doesn't work that way. Government is not going to help people and it will not do the right thing – unless there is an organized community effort forcing it to do right. It is not in the best interest of government (and industry) to do anything about health problems in communities. Why not? Because government and its corporate friends are responsible for cleaning up the problems. They have to pay for health and environmental damages. And they don't want to do that.

Let me tell you how I learned this lesson. It happened during my work at Love Canal. I had been hired by the state of New York to be a technical advisor for the residents represented by the Love Canal Homeowners Association. It was clear from the beginning that the state perceived my role as a "buffer" between it and the community. The state officials thought it would be easier to deal with a professional consultant than with "emotional, uncontrollable and unpredictable" residents.

At first, I was accepted by the state officials as a one of them. After all, I was on their payroll. The community had doubts about my value to them for the same reason. I decided not to take sides, but to let the facts guide my judgment and decisions. I naively thought the state scientists that I was working with were thinking the same way.

I worked with Lois Gibbs and other community leaders to collect information on health problems and contamination at Love Canal. Then, I went with Dr. Beverely Paigen to Albany to present much of this information to the Deputy Commissioner of Health and several epidemiologists and toxicologists working for the New York Department of Health. They listened to what we had to say and looked carefully at the data we put before them. We had considerable discussion that I perceived as reasonable scientific debate, not hostility. Dr. Paigen and I left the meeting feeling the government had heard our message and were going to investigate the information we had left with them.

With shock, I read the headlines in the papers the next day. The state scientists called the data on health effects in the Love Canal community "Useless Housewife Data." I couldn't believe they said that! They were so reasonable in the meeting. What was going on? I soon found out.

My new knowledge came after a long emotional public meeting. I got back to my hotel after midnight. I was staying at the same hotel as all the state representatives. I wasn't tired, so I went to the bar to sit for a while. There I found most of the people from the state, drinking and talking about the meeting. They invited me to join them. I sat down not quite knowing why, since I was quite upset that so little had been accomplished at the meeting. The community was angered by the way the meeting had gone and deserved to be. Few of their questions had

been answered.

Everyone had apparently been at the bar for some time. The state officials were talking quite freely about the meeting and how they felt. The Deputy Commissioner of Health, who had been in charge of the meeting, was doing most of the talking. He was openly bragging about the way he had handled the meeting, "I didn't give them anything," he repeated over and over with a clear sense of pride.

He was proud that when the community had asked hard emotional questions about why their children were so sick or why they couldn't be relocated, that he had not given "in" to them, that he had not given them answers to their questions, that he had "won the battle." I was shocked. I couldn't believe what I was hearing. Here was the number two person in the New York State Health Department bragging in a bar that he had not given the community any information at a public meeting!

I realized the Health Department already knew what was going on in the community. It didn't need the information that the community was collecting. No matter what the facts were the state officials were not going to tell the public anything.

It was then that I realized that dealing with contamination issues was a game of sorts, a game that government didn't play straight, and that politics was more important than science. In fact, science and the "facts" had very little to do with the decisions being made. What mattered most were economics and protecting private interests. If the Love Canal people were sick, how would the state take care of them? Where was the money going to come from to take care of them or to clean up the site? How would this affect all the other sites in New York or, for that matter across the country?

The "facts" are not important. How you play the politics of the "game" is what matters. Apply enough pressure on the right people, and you'll get your site cleaned up. Spend your time digging for "facts", and you're playing right into the hands of your opponents because they already know the "facts". Government won't be convinced by any facts you come up with unless you back your facts with well-focused, well-organized political pressure.

Baffled By The Terms

To help you keep up-to-date with some of the latest terms and acronyms being used by government industry, and their consultants, we've put together this list of terms. We want to thank Paul Connett for contributing to this column.

Acceptable Risk: What government and industry decide is acceptable for you.
Alternate Concentration Limits (ACLs): Another safety standard used by EPA to tell us everything is ok.
Cost-Benefit Analysis: A mathematical process arranged to make people bear maximum cost while providing corporations with maximum benefits.
Hysterical Housewife: A woman leader who challenges the logic of dumpers and government officials, a sign of mental instability. For some odd reason, there is no masculine gender version of this term, possibly because most policy makers are male.
GUMBY (Gotta Use Many Backyards): A strategy to divide and conquer communities that exercise their democractic right to have a say in what kind of facilities are sited in their communities.
Meets All State and Federal Regulations: If we can't find it safe, at least we can satisfy the bureaucrats.
NIMBY (Not In My Backyard): Industry's word for democracy.
Risk Assessment: A rationale for the uncertainties of science that uses more assumptions than facts and is more guesswork and opinion than science.
No Statistical Significance: Your opponents are not impressed with the amount of death, illness and suffering in your community. You just don't have enough dead bodies in the streets yet. "Lets wait until a few more people die before we do something."
Radical: What you are called when industry and government are made uncomfortable by your actions.
Resource Recovery: Resource Destruction.
Special Waste: Solid waste incinerator ash. It's too expensive to treat as hazardous because it is highly toxic. So industry and government call it "special".
State-of-the-Art: Industry's latest experiment.
There's No Evidence of a Problem: Nobody has looked for any problems.
There's No Cause for Alarm: Grab the kids, the dog and everything you can carry and head for the hills.

Science and the Grassroots Toxics Movement: Ten Years of Partnership

By David Ozonoff, MD, MPH

Ten years is a long time in the life of a grassroots citizens' group, but an eyeblink in the history of science and medicine. Considering this longer view, however, the last decades have not been noteworthy for advances in our understanding of how chemicals in the environment affect the health of our communities. This lack of progress can be laid, to a large extent, on the indifference or outright hostility of our federal and state governments, the major sources of research funding for environmental health.

Despite the obstacles, however, we can see some progress. And the engine of that progress has largely been the grassroots citizens' movement which has provided the required information, the indispensable energy, the unfailing persistence and the vital inspiration for a handful of scientists who work in the field of health effects from toxic exposures. I say this from my personal experience as a scientist who has had the opportunity and privilege of working with many communities over the years.

It's been a while since I had my first experience trying to understand the extent of damage to a community from hazardous waste exposure. As I look back on that event I can see more clearly how far we have come and how far we have yet to go.

It was shortly after I arrived at Boston University as an Assistant Professor. My first task was to build a teaching and research program in environmental health at the Medical School's new program in Public Health (later we would become the 23rd School of Public Health in the country). One day I received a call from the city of Boston's health department, asking for help in assessing the health of a neighborhood that surrounded a hazardous waste storage and transfer facility in the heart of a densely populated area in one of Boston's poorer areas. The site was unfenced and stacked with barrels containing known and unknown chemicals, some leaking and none well secured. Among the known materials were highly flammable substances like tetrahydrofuran. The site was also known as a favorite Saturday night hangout for some of the area's teenagers who would sit around drinking beer and smoking cigarettes on warm summer evenings. The potential for catastrophe was evident, but the city, state and federal officials had been unsuccessful in shutting down the operation despite numerous violations of its license. It was rumored that the operators were connected to organized crime and an EPA inspector who visited the site was said to have been roughed up on one occasion.

The gravity of the situation notwithstanding, it is likely that nothing would have been done had it not been for the efforts of local residents who brought the situation to the attention of the health department. At the residents' insistence, an inquiry into possible health effects in the neighborhood was begun and I was called upon for assistance. Unfortunately my effort in this case was more on the order of the blind leading the blind than truly expert help. The simple fact was that neither I nor many other people had much experience in dealing with these situations.

The design of the study was a simple concentric rings affair. We sent public nurses out with a questionnaire concerning a variety of acute symptoms and they visited as many households as they could. The results appeared to show more problems in the rings close to the site than further away, strongly suggesting an adverse effect from the site. Our interpretation of the results was characteristically academic and cautious: "Thus, proximity to the site of the

hazardous waste dumping is a significant factor in reporting of health problems during the year of heaviest exposure." Nothing I have learned since has made me want to alter this judgment, except perhaps to eliminate some of the weakening qualifications we expressed at that time.

As I look back on this first investigation I see both how primitive it was and at the same time how it contained the essence of a number of investigations we have carried out since. Because of the short time since exposure began in this study we could only look for acute effects such as birth defects. However, the increases in some symptoms also matched the effects that occur most often and that rob communities of their productivity, destroy their sense of well-being, impair their quality of life, and deny them their comfort and right to a safe home.

It would be almost four years before we had a chance to demonstrate more rigorously that waste sites could cause these increases in symptoms in an exposed community. The Silresim waste site in Lowell, Massachusetts, started as a recycling facility in 1970 but soon ran into financial difficulties and by 1974 the operator was taking in far more waste than he could process. The excess was piling up on the site, which was situated in a working class neighborhood of Lowell, just south of the urban center of the city. State authorities were unsuccessful in closing the facility, but economics did what the inadequate laws of the time could not, and in 1976 Silresim went bankrupt, leaving a million gallons of hazardous waste in leaking barrels on the site. The smell of chemicals was clearly evident around nearby houses.

Now a familiar story repeated itself. The neighbors organized, helped by a statewide consumers group called Massachusetts Fair Share, and a bitterly contested Democratic primary gave them the opportunity they needed. They followed the incumbent governor around from campaign stop to campaign stop (with special emphasis on fund-raising events) until he was desperate to satisfy them. The barrels were removed at state expense and he promised to fund a health study by an outside contractor (no one trusted the state health department to do an honest job). It was two more years before the contract for the study was put out to bid and we received the contract.

The resulting Silresim study was a watershed in our experience and one of the first such studies to demonstrate clearly the terrible toll on a community's well-being from exposure to toxic chemicals. We were able to show, using quite rigorous methods, that people who lived close to the Silresim site had significantly increased rates of a variety of symptoms such as wheezing and tightness in the chest, unusual fatigue, heart palpitations, frequent colds and similar symptoms. Since then these findings have been replicated at other sites by other investigators (e.g., the Stringfellow site in California).

The demonstration that a variety of symptoms are increased around waste sites is very important, but I don't want to leave the impression that the more serious health impacts, like cancer and birth defects, don't occur. On the contrary, we and other investigators are now able to show that they can occur. One example is a recently completed cancer study in the Upper Cape Cod region of Massachusetts, done in collaboration with my colleague, Dr. Ann Aschengrau, from the School's Department of Epidemiology. In the Cape Study we have been able to show, among other things, that there is a greatly increased risk of leukemia and bladder cancer to people who drank public water contaminated with the common dry-cleaning solvent perchloroethylene. We also found increased risks of cancer from a number of other environmental hazards.

The Cape Study, like the Silresim study, would never have been done had it not been for the persistence and forcefulness of a local community group, Upper Cape Concerned Citizens. As a result of their pressure the state funded the study, and throughout its design, execution and analysis we worked closely with our citizens' advisory board. They helped with innumerable suggestions of a scientific nature and provided important and valuable information about details of the environment in their community.

In the space allotted to me it is impossible to give a complete or even adequate account of the most important scientific events of the last decade. Suffice it to say, that in almost every case, the essential ingredient has been citizen initiative, input and involvement. Scientific technique is necessary and plays a role, but its importance pales in comparison to the efforts of local community groups, not only for the political pressure they provide but because they are the most important ingredient in the science itself: it is they who know what health effects they are suffering, where the environmental hazards are, and the pathways the hazard takes to their families. They are also quick to know when they are being fed a bill of goods by public officials more concerned with not rocking the boat than with stopping the boat from sinking.

I congratulate CHEJ and all its members for the immense scientific contribution they have made to our understanding of the health effects of toxic chemicals. It is with pleasure and admiration that I anticipate recounting the many more advances we will accomplish together when we do this again in ten years!

David Ozonoff is a retired Professor of Public Health from the Boston University School of Public Health.

Chapter 2

Landfills

Secure Landfill? Don't Bet the Farm on it!

How many times have we heard government officials or industry representatives claim that "secure landfills" can solve a hazardous waste problem?

And how often have concerned citizens been dismissed as hotheads and troublemakers, unwilling to listen to "the facts"? But scientists are now finding that many of the public's worst fears are well-founded. Even state-of-the-art landfills are not secure and will not contain wastes for long periods of time. Let's look at "the facts."

Dr. Peter Montague, Project Manager of Princeton's Hazardous Waste Research Program, has reviewed public records held by the New Jersey Department of Environmental Protection regarding four, "secure," state-of-the-art chemical landfills. Each of these landfills was equipped with double liners: a primary liner closest to the waste and a secondary liner. The primary liner often consists of two plastic liners. One made of Hypalon, a tough, plastic-like product and the other made of polyvinyl chloride (PVC). The secondary liner usually consists of 30 inches of clay.

After evaluating the information, Montague found that the primary liners at all four landfills - this is the liner closest to the waste - were and still are leaking. Testifying before Congress Montague stated, "The failure of four primary liners does not give me reason to have confidence in landfills in general...the conclusion is inescapable that all landfill liners will ultimately leak."

Evaluations have also been made in other states. A report by the New York State Attorney General's Office found that "secure" landfills in the state could not permanently isolate toxic wastes without expensive remedial work and perpetual care. This conclusion was based upon documented cases of deteriorating landfill caps, high leachate levels, and premature remedial work at three landfills. At Wilsonville, Illinois, a landfill once considered one of the most secure in the nation was found to be leaking severely. Chemical concentrations as high as 36% were reported in monitoring wells nine feet from the burial site. By court order, the waste was dug up and transported to a more "secure" disposal site.

Laboratory findings are demonstrating the inadequacy of clay liners in containing hazardous wastes. Dr. Kurt Brown of Texas A&M has shown that clay liners leak many times faster than experts has previously believed. "All clay liners," notes Brown, "eventually leak, even if they are just storing water." More importantly, certain organic chemicals commonly placed in landfills "could cause clay liners to leak 1,000 times faster than designers anticipated." In related research at Colorado State, Dr. Fred Lee found that certain organic solvents such as benzene, carbon tetrachloride, and xylene can shrink moist clays, resulting in the formation of cracks or channels in three types of clay liners. Echoing the results of these and other recent research findings, Allen Morrison of Civil Engineering magazine remarked, "Researchers are finding that the clay liners typically used in landfills may be vulnerable to the effects of certain chemicals which can modify compacted clay soils that were of low permeability, rendering them highly permeable. In addition to problems with liners, a whole host of other factors can undermine the effectiveness of landfills.

These include:

- Inappropriate siting.
- Inadequate facility design.
- Poor construction and materials.
- Adverse weather conditions-resulting in damage to beams and covers, off-site runoff, and leachate production.
- Earthquakes and earth tremors.
- Internal activity, including uneven settling which can cause cracks in the cover, decay of drums and the release of wastes.
- Inadequate post-closure monitoring and maintenance.
- The inability of government to prevent encroachment by people and construction activities over the long time periods that some waste remain hazardous.

The state of California, which prepared this list, states that there is no guarantee against these problems because of our limited understanding of the complex processes involved and because the prediction of success with any certainty requires prohibitively expensive preliminary site investigations, extensive monitoring during the operation of the landfill and perpetual care after site closure.

Raising similar concerns in his Congressional testimony, Dr. Montague noted, "even in those few, rare instances when an adequate geologic liner can be found to prevent leakage through the bottom of a landfill, the critical element will remain the top cover liner, the umbrella. The umbrella is not only the most important part of a landfill, but it is also the part most likely to fail." Montague went on to list six forces which, acting in unison, will "ultimately destroy any cap cover that humans can devise in the ground." These forces are erosion, vegetation, the activity of soil-dwelling animals and insects, sunlight, subsidence, and human encroachment.

Even the U.S. Environmental Protection Agency has found landfills ineffective in the long run. Here is its position in the Federal Register of February 5, 1981:

"Unfortunately at the present time it is not technologically and institutionally possible to contain wastes and constituents forever or for the long time periods that may be necessary to allow adequate degradation to be achieved. Consequently, the regulation of hazardous waste land disposal must proceed from the assumption that migration of hazardous wastes and their consitutents and by-products from a land diposal facility will inevitably occur."

We have quoted many different sources in this article for good reason. Scientific opinion does not put much stock in landfills as long as the

long-term solution to hazardous waste disposal. As a result, we should stop thinking of so-called "secure" landfills as secure or safe. At best they slow down the time before landfilled waste leak out into the environment. They do not prevent it.

These are the reasons why citizens all over the country are outraged by the existence of hazardous waste landfills or the siting of new ones. Their concern is not fueled by hysteria or emotional insecurity, but rather by the facts, that is, scientific research and the disturbing performance record of existing state-of-art landfills.

For more detail reports on the technical problems of "secure" landfills, contact CHEJ.

Baffled by the Terms

Leachate is liquid that migrates through soil from a landfill or surface impoundment and may contain hazardous compounds.

A berm is a small dirt wall used to contain or prevent surface water from spreading from a contaminated area.

Subsidence is an uneven settling or shifting of the topsoil (or cover) of a closed landfill. Waste material placed in landfills are usually the compacted when they are put into the fill. As time passes, they slump or settle under the weight of the wastes above them. In addition, as organic matter decays, solid matter is turned into gases which tend to move out of the landfill, leaving void spaces. These void spaces become filled from above by wastes sinking down. This natural force can cause cracks or tears in the cover of a landfill thus destroying the integrity of the cap.

Permeability is the rate at which water or leachate moves through soil. Sandy soils are generally considered to be highly permeable while clay is less permeable.

What Lurks Within Your Town Dump?

Have you ever thought about where your household garbage goes? Have you ever wondered what "small" businesses and industries of America do with their trash? How do the many industries that are not required to use "secure" landfills dispose of their hazardous wastes? They all end up in the town dumps, in the municipal (or sanitary) landfill in your community.

"So What?" you say, "these wastes are harmless, not like evil toxic chemicals associated with "big businesses". You couldn't be further from the truth. So-called municipal landfills can be more threatening to your health and the environment than a hazardous waste landfill. In many communities, "just household garbage" has contaminated the water supply, causing cancer, birth defects, kidney and liver problems, disease and death. What was once believed to be a "harmless" town dump has become the Number One concern.

The reasons are simple: (1) Large quantities of hazardous wastes are disposed of in these landfills; (2) No safeguards or warning devices are built into these landfills to detect leakage; and (3) Small generators of hazardous wastes are allowed by local law and the federal Environmental Protection Agency to dispose of a wide variety of hazardous wastes in these landfills.

Municipal landfills were originally intended to contain little more than household garbage. With the increased generation of industrial wastes, all this changed. These landfills became toxic dumps as all kinds of substances, including hazardous wastes, were disposed of there. And if enough small industries choose to dispose of their hazardous wastes in a single landfill, then large quantities of these toxic chemicals will seep out into the community.

The types of hazardous waste that are exempt from federal regulations and thus could end up in your town dump include:

- Mining waste – toxic metals, radioactive waste;
- Waste from energy production – toxic metals, toxic organic solvents;
- Waste oils – toxic organics, heavy metals;
- Agricultural waste;
- Waste from use of environmental protection equipment (such as scrubbers on incinerator stacks) – sludges; and
- Small generators of hazardous wastes – industries producing less than 2,000 pounds of hazardous wastes each month, such as dry cleaners and gas stations.

Other hazardous waste that ends up in town dumps include components of simple household garbage such as plastic garbage bags, solvents, drain-O and other cleaners, and aerosol cans. Read the label on the next product or container that you're ready to throw out, think about how every household in the country does the same thing, and you'll begin to understand the contribution of this source.

These landfills have been accepting hazardous waste for years with absolutely no regard for whether the landfill could contain this waste. This means that toxic chemicals are buried in your neighborhood. Only now are municipal landfills being built that include double liners, a leachate collection system, and a monitoring plan that provides minimal protection. Most existing municipal landfills have none of these safeguards. Chemicals can leak into the environment for years before anyone discovers that problem exists. And when a problem is discovered, it is usually because someone became ill drinking contaminated water.

Because these landfills are constructed with little or no protection, they tend to leak faster and in greater quantities than a toxic waste dump. For example, in Naugatuck, Connecticut, toxic chemicals moved out of a sanitary landfill into the drinking water in such large amounts that the local Board of Health had to issue a court order telling people NOT to drink the water, and ordering the generator of the landfill to provide drinking water for all the residents affected. Benzene, toluene, methylethyl ketone, lindane and dioxin – chemicals that cause cancers, reproductive disorders, and death – were among the chemicals found in the wells of nearby residents. People were exposed for years before learning of the problem.

In Baltimore, Maryland, the Monument Street municipal landfill was ordered closed when investigations revealed that 10,000 drums of "industrial" wastes might have been disposed of in the landfill. Further investigations found toluene, ethyl benzene, trichloroethylene and vinyl chloride in the air coming out of pipes intended to vent natural build-up of methane gas in homes adjacent to the landfill.

In Port Washington, NY, homes near the North Hempstead sanitary landfill exploded when methane gas migrated through the soil into these homes. Later, vinyl chloride and other toxic chemicals were found in vents installed to eliminate the gas build-up. Residents are fighting to close this landfill.

These stories are not isolated examples. Memphis, TN; Hialeah, FL; Oyster Bay, NY; Freehold, NJ; York, PA; Boulder, CO; Wauconda, IL; Andover, MN; and Lansing, MI are all facing contamination problems caused by chemicals leaking from municipal landfills – the town dump.

The extent of this problem is simply unknown. The office of Technology Assessment (OTA), the scientific research branch of Congress, estimated that of 255 million metric tons of hazardous wastes generated in this country, only 40 million tons are regulated. Are the remaining wastes going into our local town municipal sites in the U.S. All of these landfills legally can accept hazardous wastes from "small" generators: small businesses such as dry cleaners (trichloroethylene, tetrachloroethylene); gasoline stations (oil sludges, waste oils); and from consumers such as yourself.

Many of these landfills are ticking time bombs waiting to explode in your backyard.

People need to be aware of these problems so they can begin to force their local, state, and county officials to address this very real and very imminent problem. Identification, evaluation, and cleanup of these sites is urgently needed. Communities must identify where in the town and/or county their dumps are. Then you must identify who's responsible for the site, what is being place there and by whom, what monitoring is being done, and what problems presently exist or could develop in the future.

If your local government refuses to identify, evaluate, monitor and/or clean up a site, you must then organize you community to apply the necessary pressure to force action to be taken. For more information on how to do this, or for more details on municipal landfills, contact CHEJ.

Chapter 3

Incinerators and other Burning Options

The Problems With Hazardous Waste Incinerators

Residents in East Liverpool, Ohio have been fighting to shut down a commercial hazardous waste incinerator for more than ten years. Residents in Jacksonville, Arkansas; Times Beach, Missouri; and New Bedford, Massachusetts fought plans to "clean up" Superfund sites using mobile incinerators. Incinerators have become a favorite means of "getting rid" of hazardous waste. But, whether in huge commercial facilities or much smaller mobile designs, incinerators suffer many critical limitations. The most fundamental are described in this article.

1. Incinerators cannot destroy 100 percent of the waste that is burned, no matter how well designed. As a result, chemicals that are burned in an incinerator will end up in the air, land, and waterways of the surrounding community. Incinerators cannot achieve in practice what is predicted in theory.

2. Incinerators generate toxic emissions, including heavy metals such as arsenic, cadmium, mercury, chromium, and lead, which cannot be destroyed by incineration. Metals stick to tiny particles in the emission gases which escape the pollution control equipment. These tiny particles can be inhaled deep into the lungs where they enter the body and cause damage.

The amount of heavy metals which can be emitted is staggering. Research shows that as much as 53 percent of heavy metals incinerated are released in stack gases. One incinerator was found to be emitting almost 6,000 pounds of lead a year. Exposure to heavy metals can cause cancer, respiratory damage, liver disease, and neurological disorders, even at low concentrations.

3. The most dangerous emissions, however, are the "products of incomplete combustion" or PICs. These substances are not in the original waste but are newly formed during the burning process. PICs include dioxin, one of the most toxic and dangerous chemicals ever tested. Dioxin can cause cancer, birth defects, skin disorders and liver damage. Also, dioxin is fat soluble, meaning that it will accumulate in living organisms and remain in the body for long

periods of time.

Other PICs include substances like methylene chloride, carbon tetrachloride, chlorobenzene, chloroform, trichloroethylene, naphthalene and phosgene. Most of these chemicals affect the liver, lungs, and central nervous system; some can cause birth defects and reproductive disorders; most cause cancer. Incinerators also release acid gases such as sulfur oxides and hydrogen chloride that contribute to acid rain, particulates that carry heavy metals and PICs, nitrogen oxides that contribute to smog formation, and carbon monoxide.

4. Pollution control equipment cannot eliminate toxic emissions. Even the "best available air pollution controls" are not 100 percent effective. At best, most pollution control equipment can only remove between 90-95 percent of the chemicals in the stack gases.

5. Incinerators generate two types of toxic ash that need to be disposed of. Bottom ash remains in the burner after solids are burned and fly ash collects in the pollution control equipment. There is usually more fly ash than bottom ash and it is more toxic, although both types of ash are considered hazardous by EPA and must be disposed of in a hazardous waste landfill. Thus, incineration does not eliminate the need for landfills.

6. Incinerators generate toxic wastewater that also needs to be disposed of. Almost all incinerators use wet scrubbers to remove acid gases. These wet scrubbers use water that picks up many of the toxic chemicals present in the waste stream. Most incinerators dump this wastewater in a nearby stream or river.

Other problems with incinerators include the potential for leakage while waste is stored before burning; the likelihood of transportation accidents as waste is delivered to the site and ash is removed; the potential for explosions and fires, which may release large quantities of toxic chemicals into the local community; fugitive emissions (unplanned and unintentional releases) from spills, leaky valves, cracks, damaged drums, dust from ash piles left on the site, or evaporation of chemicals from pits, ponds, or lagoons. Some estimate that the amount of fugitive emissions released from an incinerator may exceed the amount of toxic chemicals released intentionally from the smoke stack each year.

All of these emissions and problems occur when an incinerator operates as designed or planned. But what happens when something goes wrong? All incinerators undergo periods of "upset" during which they do not operate properly. Upsets can occur because of a power or equipment failure, poor mixing, or changes in pressure due to burning reactive or explosive waste. During upset conditions, toxic emissions can reach very high levels and cause serious problems in the surrounding community.

Because of these problems, we know that incinerators pose many risks, but we do not know how great the risks are. Very little information is available on how much or at what level contaminants come out of incinerators. How far these contaminants travel is also poorly understood. Without this information, it is difficult to determine public health risks. This uncertainty is further complicated because scientists know very little about what happens when people are exposed to low levels mixtures of toxic chemicals for long periods of time.

What is clear is the track record of the incineration industry. The overall pattern is that these incinerators have been poorly managed and operated, and they have been a continuous source of air and groundwater pollution.

Given these many problems, why does EPA and industry embrace incinerators so strongly? The answer lies in three factors: (1) Incinerators offer a simple alternative to landfills because they take all types of waste without needing much processing or pretreatment. Incinerators allow industry to continue to operate the way they always have; (2) Incineration is a relatively cheap disposal method; and (3) the waste "disappears" into the air, taking with it any potential liability a company might have.

What Are the Alternatives?

The alternative is to get companies to reduce the amount of waste they generate. This does not mean merely reducing the amount of waste that needs to be disposed of, which is EPA's idea of waste reduction. EPA's approach essentially is to reduce the mass of waste to be disposed of, which results in higher concentrations rather than lower levels of contaminants. This changes nothing about how much waste industry generates or how they generate it.

The real solution lies in using serious waste reduction methods such as changing the raw materials used in production, changing production technology and equipment, improving production operations and procedures, substituting safer and less toxic chemicals, recycling potential waste as part of production, and redesigning or reformulating end-products so that less waste is generated. According to the Congress's Office of Technology Assessment, companies can reduce the amount of waste they generate by as much as 50 percent by using true waste reduction methods.

But, as long as industry can site new incinerators, they are not going to change how they do business. As long as a cheap, easy alternative exists, industry will not use serious waste reduction methods. But if communities such as East Liverpool can stop the siting of new incinerators, companies will be forced to sit down and come up with ways to cut back on the waste they generate. Many grassroots groups across the country have been successful in stopping proposed incinerators. They have done it with limited resources, hard work, and the power generated from an organized, determined community. By continuing and supporting these efforts, we will be successful in forcing companies to stop using ill-conceived disposal and cleanup methods and get them to reduce the waste they generate and use more effective permanent cleanup methods.

How EPA Regulates and Controls Incinerator Emissions

EPA requires incinerators to destroy 99.99% of the waste entering the incinerator. This is called the "Destruction and Removal Efficiency" (DRE) of the incinerator. DREs are calculated during a trial or test burn conducted before a permit is issued.

Usually two to three "pure" chemicals are measured and burned separately during the test burn, which is conducted under carefully controlled conditions. But these conditions do not reflect actual operating conditions. In the real world, waste is not a single chemical but a complex mixture, and operating conditions are very difficult to control. As a result, the test burn has little relationship to the day-to-day operations of the incinerator and the information gathered may be irrelevant and misleading. But, by passing this one test, incinerators can be licensed to operate for as long as ten years without having to do another test burn.

Even if you assume the 99.99% number is correct, tons of toxic chemicals are still being released into the surrounding community. For example, a typical incinerator will process more than 36 million pounds of hazardous waste each year. With no unexpected releases, no fugitive emissions, and no accidents or upsets, such an incinerator would still emit 3,600 pounds (nearly two tons) of hazardous chemicals each year. So, while removing four nines may sound good, it still allows large quantities of chemicals to be released into the local community.

DRE measurements are also subjective. One scientist working for the National Bureau of Standards looked at how EPA measures DREs and found that when he used the same emissions results but made different assumptions, he got a DRE of 79.23% instead of 99.99%. The difference was in the degree of confidence put into the emissions results.

EPA requires testing the stack gases, but this testing is limited to carbon monoxide, acid gases, and particulates. As a rule, EPA does not require testing for dioxins, heavy metals and other chemicals released from the incinerator, although states can require more specific testing.

Garbage Incineration Makes No Sense At All

Hundreds of communities across the country, in both rural and urban areas, are worried about where to put their garbage. Landfill space is running out. Siting new facilities or expanding old ones faces stiff local opposition. As a result, many city managers fearing a waste crisis are turning to incineration as a quick fix solution.

Garbage incinerators are operating around the country with many in planning or under construction. Many of these are mass burn incinerators, the worst possible design. They burn waste without any separation or recovery of materials.

Incinerators won't solve the solid waste crisis. Instead of a leaking landfill polluting groundwater, you have an incinerator polluting the air with dioxins, furans, heavy metals and acid gases. And you still need a landfill, because the incinerator only burns between 65-75% (by weight) of the waste.

Air Emissions

Incinerators generate toxic air emissions, including dioxins, one of the most toxic chemicals known; furans; heavy metals such as mercury, cadmium, chromium and lead; acid gases that contribute to acid rain; and particulates.

The presence of dioxins is an important argument against incinerators because they produce their toxic effects at extremely low levels, and because they may form after incineration is complete. Work done by the late Dr. Barry Commoner's research group on Long Island, New York found that dioxins and furans form on particulate fly ash in the cooler parts of the incinerator as the particles leave the furnace and pass out of the stack.

The dioxin problem is further complicated by the fact that they concentrate in the food chain. Dr. Paul Connett of St. Lawrence University found that TCDD (the most toxic form of dioxin) levels in milk from cows grazing near incinerators were 200 times higher than the daily dose of breathing the same air. Drinking one liter of milk gave you the same dose of TCDD as breathing the air near an incinerator for 8 months. Such concentrations of dioxins and furans in the food chain greatly increases risks for both people living near incinerators as well as people who live hundreds of miles away who drink contaminated milk.

Ash

Incinerators generate one ton of ash for every four tons of waste burned. There are two types of ash: bottom ash, the residual material left after burning; and fly ash, small particles that escape the furnace with the hot emission gases. Fly ash comprises about 10% of the total. Ash contains heavy metals (which cannot be destroyed by burning), dioxins, furans and other toxic chemicals present in the original waste. In a recently study, 9 or 11 samples of fly ash and 2 of 16 samples of bottom ash failed EPA's toxicity test, and are thus considered hazardous waste which must be disposed of in a chemical landfill.

Wastewater

Incinerators generate huge amounts of contaminated wastewater. Large quantities of water are needed to cool the bottom ash before it can be removed and, in many incinerators, to remove acid gases. This water needs to be properly disposed of.

Other risks associated with incinerators include:

- Incoming waste can't be screened for hazardous materials;

- Potential traffic accidents during transport of incoming waste or outgoing ash; and
- Dispersion of contaminated dusts from ash piles stored on-site.

What Is Mass-Burn Incineration?

Mass burn incinerators accept waste as collected from the curb and burn it. Proponents of garbage incinerators like to call them resource recovery, waste to energy or trash to steam plants. Resource recovery is an exceptionally poor choice of terms: these plants do not recover or recycle any resources. Instead, they recover energy from steam (and some don't even do this). Because such plants don't separate out any materials, its air emissions and ash include many toxic substances, making these plants the worst possible incineration design.

Incineration of Contaminated Soils..A Wolf In Sheep's Clothing

Have you been confronted with a proposal in your community that will use a "regenerative thermal oxidizer?" or a "rotary drum drier?" or how about a "low temperature thermal extraction system?" Has the local cement kiln or asphalt plant suddenly decided they want to "treat" contaminated soil in their boilers?

Dozens if not hundreds of communities across the country are facing a rash of proposals to burn contaminated soil using a wide variety of "thermal" methods that have one common threat – nowhere does anyone mention the word incineration. Most of these communities are faced with proposals to burn soil contaminated by leaking underground storage tanks (LUST) that contain petroleum hydrocarbons and gasoline additives. In other situations, EPA or the state has decided that contaminated soil from the local contaminated site can only be dealt with by incineration.

It seems the word is out – burning and incinerating contaminated soil is the way to go. EPA supports it and the push is on. But because communities understand the dangers of incineration, don't call your technology or treatment system incineration. Call it anything, call it a regenerative thermal oxidizer, a rotary drum drying or low temperature thermal extraction – just don't call it "INCINERATION!"

Incineration has become the big taboo word and no government or private company will use it no matter how obvious it is that the proposal calls for incineration. This is a ploy by government and industry to confuse and fool the public. Their intent is to make you think that the issues and concerns about incineration don't apply to their proposal. "This is a new and different process that does not incinerate the waste."

This a not the solution to the complex problems of contaminated sites. Lets look carefully at one example. In a community in upstate New York, EPA proposed using a low temperature "thermal extraction" system to clean up a contaminated site. This method involved excavation of contaminated soils and then placement of these soils in a heat treatment service. EPA passed out fliers that described the process and made it clear that this treatment method did not incinerate the soil as typically occurs in an incinerator.

Instead, "heated air" (there was no explanation of how the air is heated) is passed over soil driving volatile chemicals out of the soil and into the air. This contaminated air is then passes through air pollution control equipment that removes particulate and acid gases.

Giving EPA the benefit of the doubt, assuming that they really aren't "incinerating" the soil, this thermal treatment method is, as a practical matter, no different than if the soil was actually incinerated. Systems that "separate" chemicals from soil by using heat may be slightly different than commercial incineration systems, but this doesn't change the basic function of the machine: Volatile gases are still formed during the treatment process which results in toxic chemicals being released out a stack that is fitted with air pollution controls. In the end, the results are essentially the same.

If it looks like a duck, walks like a duck and talks like a duck, then in all likelihood it is a duck. There's going to be little, if any, difference between the emissions of a "thermal treatment" system and an incinerator. Whatever is burned in the burner will end up in the stack gases; products of incomplete combustion (PICs) will be formed; toxic ash (the soil in this case) will remain and contaminated wastewater will be

generated. In addition, there are transportation, storage and handling issues that need to be addressed.

In those situations where contaminated soils from LUST are burned, the companies are saying that the petroleum hydrocarbons from the gasoline will be destroyed in the process with nothing left over. This simply is not true. One of the major issues with leaking gasoline storage tanks is the additives found in gasoline.

These additives include tetra ethyl lead, ethylene dichloride (EDC), benzene, toluene and xylene. These additives are the worst components of gasoline. They are also the most toxic and pose the greatest threat to public health and the environment (see the box).

Burning/thermal treatment is a poor choice for these soils because the additives are so hard to destroy. Lead cannot be destroyed by incineration/burning/thermal treatment, so whatever lead is in the soil to start with will either remain in the soil or be volatilized onto particulates that escape with the stack gases. EDC is also difficult to destroy because of the chlorine bonds that hold it together. It also will remain in the soil or be volatilized and escape with the stack gases. Benzene, toluene and xylene can be more easily destroyed, but a portion of these chemicals will also end up in the stack gases.

Why does this happen? Because no incinerator/burner/thermal treatment unit can destroy 100% of the waste that is burned no matter how well designed. Whatever goes into the burner will also come out into the air, land and waterways of the surrounding community. Incinerators cannot achieve in practice what is predicted in theory. Even with state-of-the-art emission controls, you cannot eliminate toxic emissions. Not even the best available air pollution controls are 100% effective.

Making matters worse is the fact that some companies are claiming they will "recycle" the soil after it has been treated. By claiming to "recycle" the soil, EPA exempts these companies from having to comply with the usual rules and regulations that apply to the handling, storage, transport and disposal of hazardous waste. Companies are making this argument to avoid the costs associated with complying with these regulations. As a practical matter, this means that there will be few if any controls over how the soil is burned. By using this "loophole" to avoid complying with federal regulations, companies are free to do whatever they want with the contaminated soil.

Cleaning up contaminated soil does not require incineration or thermal treatment. There are alternatives to these methods. One is called "Vacuum Extraction." This technique uses pumps to suck gasoline fumes right from the ground passing it through a series of filters which capture the contaminants.

So in the end, the incinerator/ burner/ thermal treatment unit, whatever you want to call it, is doing little more than transferring the chemicals from the soil to the air. Very little destruction of toxic chemicals occurs. As a result, you need to look at these proposals motivated more by politics and profits than by scientific data or common sense. To fight these proposals you need to organize your community and put pressure on the decision-makers. Contact CHEJ for help on how best to do this.

For more information on hazardous waste incinerators, see CHEJ's guidebook "Incineration: The Burning Issue"which describes the pros and cons of incineration, the health risks they pose, includes strategies for dealing with one in your community and includes a list problems found at operating incinerators around the country.

The Health Effects of Gasoline and its Additives

Tetra ethyl lead - Learning disorders, anemia, encephalopathy, congenital abnormalities, neuro muscular dysfunction and cancer.
Ethylene dichloride (EDC) - Liver and kidney disorders, eye damage, central nervous system (CNS) problems and cancer.
Ethylene dibromide (EDB) - Skin and eye irritation, CNS problems, liver and kidney damage, cancer.
Benzene - Leukemia, CNS problems, liver damage, bone and blood disorders.
Toluene - CNS problems, liver and kidney damage.
Xylene - CNS problems, liver damage, irritant skin, upper respiratory irritation.
Gasoline without additives - Irritation of the skin, eyes and upper respiratory system, CNS prob lems, liver and kidney damage.

Burnin' Rubber: The Dangers of Tire Incineration

Recycling efforts are reaching records levels in communities across the country. But, many programs are coming to a dead-end when confronted with what to do with automobile tires. Estimates vary, but there is little doubt that there are billions of discarded tires nationwide lying in huge piles with an estimated 200 million more tires being added every year.

Some have suggested that the solution to this problem is to burn the tires. In fact, burn them and generate energy in a "Tire-to-Energy" or "Tire-Derived-Fuel" plant. This idea is fast becoming the latest "magic machine" or quick-fix solution to this waste problem.

The leading proponent of burning tires is Oxford Energy, Inc. of New York City. They market a machine that burns tires using a West German Technology brought to this country in the mid-1980's. Since that time, Oxford has only managed to site two plants. Their only operating plant is in Modesta, California. A second plant is being built in Sterling California.

Why Burn Tires?

The main problem with burning tires is the toxic emissions they generate. No form of incineration is 100% effective. Whatever chemicals exist in the tires will end up in the emissions. Among the most common emissions are volatile organic chemicals (VOCs) such as benzene, chloroform, 1,2-dichloroethane (DCE), methylene chloride (MC), toluene, trichloroethylene (TCE), xylene, metals such as lead, chromium and zinc and polycyclic aromatic hydrocarbons (PAHs) such as benzo(a)pyrene, benzo(g,h,i) perylene and phenanthrene. In addition, specific rubber components such as butadiene and styrene and also found in emission gases. Because many of the chemicals contain chlorine, dioxins and furans are also released from tire burning incinerators.

All of these VOCs damage the central nervous system and the liver. Benzene, chloroform, 1,2-DCE, MC and TCE cause cancer as does lead, chromium and many PAHs. But adiene is considered one of the most potent liver carcinogens ever observed. Dioxin is considered one of the most toxic chemicals ever tested. Not only do air emissions include toxic chemicals present in the original waste, but they also produce new chemicals that were not in the original waste. These are called "Products of Incomplete Combustion (PICs)" Dioxins and furans are the most common PICs.

These chemicals are found not only in emission gases, but also in other pollution sources generated by the plant. These include the oily fluid that remains after the burning is completed (heated tires melt into from 3-10 gallons of contaminated oil depending on the size of the tire), residual ash, particulate ash captured by air pollution control equipment and contaminated wastewater also generated by pollution control equipment and as ash quench water.

No Track Record on Emissions

Much of the information described above comes from data collected from uncontrolled burning of huge stacks of tires. There is very little data on emissions from burning tires in "controlled" incinerators. There are very few facilities in this country that burn tires. According to Oxford, air emissions include carbon monoxide, oxides of nitrogen, sulfur dioxide, particulate and hydrocarbons. In addition, Oxford estimated that 1.3 lbs. of mercury, 2.9 lbs. of lead and 0.00003 lbs. of dioxins and furans will be released into the air each day 560 tires are burned.

Incineration is a Poor Disposal Alternative

No matter how new and improved the technology, burning tires is going to generate toxic emissions. Emissions cannot be avoided because 1) 100% destruction cannot be achieved by incineration; 2) combustion efficiency is very hard to maintain because chlorine and metal content can vary widely from tire to tire; 3) untrained and inexperienced operators don't know how to run plants properly; 4) upkeep and maintenance are often not a high priority; 5) pollution control devices are not 100% effective no matter how new and improved.

Like any machine, incinerators wear out and break down with use. A new care doesn't work as well after 15,000 miles as it did brand new. Likewise incinerators don't work as well after burning 500 tires/day for a year as they did brand new.

Upset or failure conditions are another problem. These conditions occur with all incinerators. Failures result from loss of power, poor mixing, equipment failures, burning waste with inconsistent heat value or high moisture content, changes in pressure due to mixing reactive wastes or quenching gases before combustion is complete. Very little is known about these events except you can expect them to occur regularly and that emissions increase sometimes by as much as 100 fold. When you also consider the fact that tire burner operators have little experience in operating the complicated equipment used to burn tires, it becomes clear that upset conditions are going to occur.

Tire incinerators pose another problem – where do you store the tires until they are burned? In Modesto, California, tires are burned whole so they have a huge storage area. Tires can catch on fire spontaneously posing sever risks to a surrounding community. Uncontrolled open burning generates the same chemicals already described only in higher quantities. Stored tires are also ideal breeding grounds for mosquitoes. Usually, stored tires are sprayed with pesticides to kill the mosquitoes, adding another ingredient to the tires that will end up in the toxic emissions. If tires are shredded, the storage problem is reduced but not eliminated.

What Are the Alternatives to Burning?

While there is no simple solution to the stockpiles of tires that exist, there are some good alternatives that are not being used enough. Some are better than others. These include shredding and using tires as raw materials for roadsbeds, combined with asphalt as a new road top material or incement, remanufacturing into retreaded tires and other rubber products such as floormats, gaskets, sandals, shoesoles and bumpers.

Chapter 4

Managing Hazardous and Household Waste

Recycling Shell Game

Waste Management, BFI and other dump companies are now born again environmentalists. Suddenly they've seen the light and think recycling is a good thing to do. Right? No way. It's a fact WMI and BFI are becoming the US's biggest "recycling" companies. But the truth is their motives are not pure and are pretty dangerous.

Their main motive is to use their recycling divisions to protect their profitable dump and burn businesses. They're smart enough to know a good way to placate growing public interest in recycling is to control it. Start a new division, buy out competition and then make sure the program doesn't threaten your dump or incinerator.

WMI's RecycleAmerica division is a prime example. All across the US, WMI's going into large and small communities, ranging from Seattle to Spencerville, OH, and uses RecycleAmerica to make sure nobody else gets into the waste business. In a previous article, VISION leader Leigh Eason described efforts by WMI to buy out her group's church-based recycling program in Motevello, Alabama. They under bid competitors by hook or by crook to make sure they remain American's waste titan. We also previously reported that WMI's flagship recycling program in Seattle allegedly won the city business by omitting the cost of local utility taxes, thus coming in with a bid lower than local independents who did include them.

Business Week described WMI's recycling as a "loss leader" to bring in new businesses. In other words, we'll give your recycling as long as you give us the rest of your trash. Then, we'll make sure we recycle no more than 10% of the waste stream.

How does this affect you? WMI and BFI are pushing local recyclers out of business. Through "loss leader" bidding, they've practically wiped out the model National Temple recycling program in Philadelphia, which was a non-profit, economic development program to relieve unemployment in Philly's poorest black neighborhood.

It's not only non-profit recycling programs that are falling prey to the big guys' predation. Clarence Dawes runs a small recycling company in Prince Georges County, MD. Dawes fears she'll be forced out of business because he can't compete with WMI and BFI, both of whom are bidding to do county recycling.

What angers Dawes and Leslie Downs, another small contractor bidding on the project, is the way bidding was set up. They say the contract to collect recyclables from 34,000 county households is so big only national firms could handle it. "The number of homes should have been cut up in smaller portions," says Leslie Downs. "They pushed that number through deliberately because they knew that only a big company could handle it. The county does not want [local] haulers involved in the program."

They control how much recycling happens. They coordinate recycling with their other waste operations for maximum profit. When local governments contract with Waste Management, BFI or any other trash giant, taxpayers pay all the costs and take all the risk. Companies usually collect from local government on the contract, collect from households for the "privilege" of recycling and collect again from the sale of recyclables.

In Spencerville, OH, the local group Dumpbusters, beat WMI's proposal for a large dump to solve the county's landfill crisis. When the landfill was defeated, nearby Lima (the county seat) was under pressure to find a solution to its landfill crisis. So they contracted with WMI to run its recycling program.

WMI set up a flawed recycling program, designed to fail. In addition to the contract, they began by charging households $2/month, no matter how much waste they put on the curb. Anyone who didn't separate their recyclables to WMI's liking got a warning and a month to conform. If they failed again, that's it! No recycling for you, pal and, not only that, WMI would no longer pick up non-recyclable refuse. The only preparation or consumer "education" people got was one little flyer. Not surprisingly, participation rates are plummeting and now the county is planning to join several others in building a monster incinerator. Dumpbuster organizer Sally Teets says, "I'm really upset with this whole situation. I know they're going to blame the people for the failure of the recycling program. But it's not their fault. It's Waste Management's fault because of the way they set the recycling program up. It was destined to fail from the beginning."

Some citizens' groups charge that WMI (and its colleagues) don't even bother to recycle trash they're paid to recycle. Fayetteville, AR residents tailed a WMI recycling truck right to one of its dump in another county. In Arlington, VA, local activists suspect WMI takes newspapers collected for recycling to a nearby Ogden incinerator. Arlingtonians for a Clean Environment think they ship paper to SE Asia on empty cargo ships that brought SE Asian products to the US.

Some communities defend their community recyclers and community's ethics by raising the question, "Why do business with criminals?" They point to WMI, BFI and Laidlaw's records of price fixing, anti-trust violations and faulty landfill operations and fight for local ordinances that forbid government contracts with shady companies. These are known as "Bad Boy Laws" (Contact CHEJ for more on these laws).

But many local government officials don't have the same scruples. Dennis Bigley, chief of Prince George's (MD) County Environmental Management Division says "Waste Management meets our standards for purchase. [They] are capable of doing the job." What Bigley and his ilk are saying is that the big, national companies can come in with lower bids. Why? Based on their record of convictions for bid-rigging, cheating seems a large part of the answer. Other officials say, "But they're the only ones around who can do the job!" Why? Their record of convictions for predatory trade practices shows a large part of the answer is that they put the competition out of business, "squashed them like bugs," to paraphrase instructions BFI's regional manager gave his underlings when he ordered them to put Kelco Disposal of Burlington, VT out of business.

Lots of well-meaning people ask us why we aren't enthusiastic supporters of Waste Management and

BFI's recycling efforts. Aren't these efforts exactly what we would want these companies to do? If you look at the evidence of how the trash titans operate, you'd see that WMI and BFi aren't doing either your community or the environment any favors. Their recycling programs are thinly disguised shams, aimed at allowing the giants to retain their death grip on waste disposal services. Don't be fooled!

Sham Recycling-Part II: Burning Hazardous Waste in Cement Kilns

One of the most outrageous violations of environmental justice is the burning of toxic chemicals in cement kilns. Huge quantities of hazardous waste are being burned in kilns as "supplemental" or "alternative" fuel. And because of a loophole in federal regulations, these kilns are exempt from virtually all laws that apply to burning hazardous waste. As a result, cement kilns operate with virtually no controls, releasing heavy metals and other toxic chemicals into the surrounding community.

This is quite "legal" according to the EPA. As long as a company claims it "recycles" hazardous waste, the waste is exempt from the usual regulations that apply to managing and disposing of hazardous waste. Yet these kilns perform the same function as EPA permitted commercial hazardous waste incinerators. They accept the same waste and they actively solicit for incineration business. But, they meet virtually none of the incineration standards designed to protect public health and the environment, weak as these may be.

Because of increased disposal costs and stricter regulations of licensed hazardous waste incinerators, more and more companies are turning to cement kilns as a place to dispose of their hazardous waste.

Companies are sending their waste to cement kilns not only to avoid high disposal costs, but also to avoid potential liability. If the waste is not considered hazardous, then no one can come back later and sue them for cleanup costs or for health damages as they could if the waste were disposed of in a landfill or licensed incinerator.

There are many problems with using cement kilns to burn hazardous waste. Most fundamentally, cement kilns are designed to cure cement, not destroy hazardous waste. They are different plants. In a cement kiln, a mixture of 80% powdered limestone and 20% clay or shale is burned at temperatures that range from 2,250-2,700°F. At the end of the burning process, a "clinker" or hardened ash is formed which when powdered is cement. Some kilns are designed to make "aggregate" or the material that is added to cement to form mortar, plaster, etc. These kilns are called aggregate kilns.

Major modifications are needed to convert a normal kiln so it can burn hazardous waste: construction of receiving, storage and handling areas and installation of laboratory testing capacity to identify waste constituents. Modern commercial incinerators often have computers that monitor levels of certain emissions and other conditions. This capability doesn't exist for cement kilns. Toxic emission releases from kilns that burn hazardous waste is a major problem. No incinerator, kilns included, can destroy 100% of the waste, even with "state-of-the-art" pollution controls. Emissions typically include heavy metals such as lead, cadmium, nickel, mercury and chromium, partially burned organic chemicals and newly formed Products of Incomplete Combustion (PICs) that include dioxins and furans.

Emission tests at a Paulding, Ohio kiln showed many toxic chemicals including toluene, trichloroethane, methylene chloride, methyl ethyl ketone (all in the original waste) as well as newly formed contaminants that included benzene, tetrachloroethylene, chloroform, naphthalene, styrene and xylene.

Several kilns that burn hazardous waste have been under fire. National Cement in Lebec, CA exceeded it's permit limits for arsenic, beryllium, cadmium, chromium, lead and mercury and was fined by the state in 1989. Marine Shale in Amelia, LA has been shut down by EPA because of air permit violations and has been fined more than $2 million.

Some of these problems occurred because the kiln was operated during upset conditions. Upset conditions result when there is an operating or mechanic failure that prevents the kiln from operating properly.

EPA estimates that emissions can be as much as 100 times higher during upset conditions.

The most common upsets occur when there is a rapid movement of clinker from the high end of the kiln to the lower end. The clinker often breaks away and falls like an avalanche pushing hot gases to one end of the kiln. This causes a tremendous surge of pressure in that end of the kiln. To prevent an explosion or damage to the kiln, release valves are built into the kiln. The valves open automatically releasing clouds or "puffs" of mostly unburned hazardous waste directly into the surrounding community. These emissions bypass all pollution control equipment and are highly toxic because they have not been completely burned in the kiln. The valves stay open until the problem has been corrected even after the pressure has gone done.

Other problems:

- Bottom ash and fly ash that contain high amounts of heavy metals and other toxic chemicals that can leach from its disposal site.
- Contaminated wastewater containing the same heavy metals and other toxic chemicals found in the stack emissions.
- High turbulence that generates large amounts of particulate.
- Inadequate air pollution controls.
- Potential explosion of incompatible waste.
- Transportation accidents involving trucks or trains carrying hazardous waste to and from the kiln.
- Leaks and spills from storage tanks.
- Lack of training and experience in handling toxic chemicals.

All benefits go to the kiln operator who stands to make more profit from burning (and disposing) of hazardous waste than from making cement. The risks fall on the community.

Sham Recycling-Part III: Burning Hazardous Waste in Boilers

This is our third and last article in a series on "recycling" scams as a way to dispose of solid and hazardous waste. In the last issue, we looked at burning hazardous waste in cement kilns. This issue focuses on burning hazardous waste in boilers and furnaces.

As occurs in many cement kilns, large amounts of hazardous waste are being burned in boilers and furnaces as "supplemental" or "alternative" fuel. This happens in either of two ways. Usually, organic solvents are mixed with conventional oil to form a "blended" fuel. In other situations, waste oil, such as used motor oil, oil coolant used in electrical transformers and capacitors or waste oil from industrial operations are burned directly in the boilers and furnaces.

As a result, contaminated waste oil – oil containing organic solvents, PCBs, dioxins, furans and other toxic chemicals – are being burning in residential, commercial, institutional and industrial boilers and furnaces. These waste are burned with virtually no controls, releasing heavy metals, PCBs, dioxins and other toxic chemicals directly into the surrounding community.

The main reason this is happening is because EPA exempts boilers and furnaces from federal regulations if the company that generated the waste claims they are "recycling" the waste by burning it as "supplemental fuel." Thus the same chemicals that are burned in boilers without any of the rules or regulations that apply to the incinerators.

This means that in some communities, home heating oil sold by local distributors will contain toxic chemicals. In other communities, such as Washington, DC and Boston, Massachusetts, the local power companies are burning oil contaminated with toxic chemicals. EPA estimates that more than 900 boilers are burning hazardous waste. This practice is happening frequently and the public is NOT being told about it.

What's Wrong with Burning Hazardous Waste in Boilers and Furnaces?

There are many problems with using boilers and furnaces to burn hazardous waste. Most fundamentally, boilers and furnaces are not designed to destroy hazardous waste. They are built to generate heat. Studies conducted by EPA show that temperature and time within the flame of boilers is not sufficient to completely destroy the chemicals found in the waste oil (called Principle Organic Hazardous Constituents or POHCs) or the chemicals formed as by-products of combustion called the Products of Incomplete Combustion or PICs.

No incinerator, kiln, boiler or furnace can destroy 100% of the waste they burn, even with "state-of-the-art" pollution controls. As a result, whatever chemicals are in the waste oil will also end up in the emissions when the waste is burned. For boilers, a study conducted by EPA found that only about 90-99% of the waste is destroyed, resulting in "significant" (according to EPA) amounts of POHCs and PICs being released into the surrounding community.

Typical emissions from a boiler or furnace can include heavy metals such as lead, cadmium, nickel, mercury and chromium, partially burned organic chemicals (depending on the fuel blend) and newly formed Products of Incomplete Combustion (PICs) that include dioxins and furans.

Tests conducted by EPA show that 50-60% of lead burned in boilers end up in air emissions, that polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) were detected in 60% of boiler stack samples and that acid gas emissions from boilers and furnaces are "significant."

EPA's has admitted that "burning hazardous waste for heat recovery is similar to incinerating them and can pose a parallel or greater risk of environmental dispersal of hazardous waste constituents and PICS." People who operate boilers and furnaces have no training or

experience in handling or burning hazardous waste and the boilers and furnaces meet virtually none of the incineration standards designed to protect public health and the environment [weak as these may be]. Given these problems, we can see why boilers and furnaces pose a risk to public health and the environment.

Sham recycling is fast becoming a very popular way to dispose of hazardous waste. The Hazardous Waste Treatment Council, a pro-incineration lobby group, estimates that each year more than 10 times as much chemical waste is burned in unregulated boilers and cement kilns than in EPA regulated hazardous waste incinerators.

The reason for this popularity is simple: companies save on disposal costs, regulatory costs and protect themselves against future liability. If the waste is not considered hazardous, then no one can come back later and sue them for cleanup costs or health damages.

But be clear: the only reason boilers and furnaces can burn toxic waste is because of the loophole, not because it is "safe" to do so. EPA is aware of this problem but they are doing very little about it. They did pass some minimal regulations in 1986, but they only apply to new or "reconstructed" unites with heat capacity greater than 100 million Btu/hour.

Find out if oil companies in your community are burning waste oil. But, don't depend on EPA to protect you. Instead, get involved. Start a community group, organize your community and take control over issues that affect your health and well-being. No one can or will do it better than you.

For information on burnig waste in industrial boilers and furnaces, contact CHEJ.

Garbage to Gold? The Pitfalls of Magic Machines

Imagine a tiny Pac-Man-like creature that could consume tons of trash in a single day, almost eliminated the need for a community landfill,-"claims one of the many new companies marketing "Magic Machines" to make our garbage crisis disappear through specialized technology. It's utterly American to seek a gadget that will address a need and make its inventor a bundle of money in the process. In Lansing, MI, there was a proposal to convert trash to a charcoal like fuel; a Vermont company hoped to burn trash in a gasification plant; in Ohio, there was a developer who planned to convert trash to oil; in Richland, WA, Battelle Institute was researching ways to convert trash to "microorganic fuel" or refuse derived fuel (RDF).

But are these systems as good as they sound? Are they reasonable alternatives to our leaking, jam-packed landfills or to mass burn incinerators? Can you convert garbage into gold?

There could well be an important, proper role for Magic Machines in the overall task we all face in finding safe, effective ways to deal with the "Garbage Crisis." However, as the saying goes, "if something sounds too good to be true, it probably is." So it is with Magic Machines.

The typical Magic Machine is touted as "proven European technology." These systems generally use machines to recover and clean materials for reuse and resale by mechanically separating waste. The remaining waste is often processed into RDF which is offered as an alternative to recycling or mass burn incineration.

A Magic Machine system could certainly help improve large urban areas' solid waste management, but it isn't nearly as clean or effective as getting individual households to separate their wastes in a way that keeps recyclable material as clean and saleable as possible and that gets household toxics out of the general municipal waste stream. When a Magic Machine processes recyclable waste, that material gets tainted by being mixed together with the rest of the waste.

This reduced quality hurts marketability and increases the odds that this otherwise valuable material will simply get dumped when no one buys it. An indication of how this factor works in the real world came clear when CHEJ surveyed operating RDF plants in the U.S. We asked what extent RDF plants recycled. Typical response: recycling efforts were token at best and usually limited to large metal objects. Instead, the plants focused on producing fuel for burning, not recycling.

If Magic Machines are to find their proper place in waste management planning, we should be careful of how high we make our expectations, just as their inventors should be careful about how wild they make their claims. Perspective on the potential success of Magic machines can be gained by looking at their track record. In Europe, these systems have had their share of problems. A World Bank study of 12 operating waste processing systems in developed countries tend to be somewhat exaggerated. With few exceptions, waste-processing facilities worldwide are still in the developing stage. Few of these plants have had results commensurate with the expectations held for them."

Instead of looking for one, single "Quick Fix", a better way to make effective waste management plans is to use a blend of approaches. No one system can handle all the trash. Each system has its limitations, pluses and minuses. Metals, bulky items like stoves and refrigerators, tires and construction debris may need special sorting and handling.

Few Magic Machines have a U.S. track record. They're promoted on their European record, which doesn't necessarily apply to the U.S. European trash, in general, contains more paper and organics and less

plastic than trash in this country. These differences make adaptations of European magic Machines to U.S. needs quite difficult.

Other factors that could make "Pac-Man" lose his appetite include the prospect of mechanical breakdowns. In the U.S., we generally build things big (unlike the Europeans) and what might work well on a small-scale doesn't necessarily work in the typical American jumbo size. Marketing recyclable materials that are soiled by being mixed with food and other organic waste will continue to be a chronic barrier to recycling. Market fluctuations for recyclables cause headaches for all parts of the recycling industry and, given the generally lesser quality of the Magic Machine end-product, they're especially vulnerable.

But in an overall plan that deals with difference kinds of waste management needs, Magic Machines are worth a close look. We simply have to be careful to look critically and not behave like a kid in a toy store.

If you want to take a serious look at Magic Machines, here are some questions to ask:

- How does the process work?
- What waste products, air emissions or residues are produced during the process? How are these managed?
- What new products, if any, are produced during the process? If new products are formed, has their toxicity been tested?
- What wastes can and can't be handled or treated by the process?
- Are there odor, insect or vermin problems?
- How much can be processed at any one time?
- What are the back-up plans for managing garbage when the system's not working (because of break-down or routine maintenance)?
- On what types of waste does this system work best?
- Has the process been used in any communities similar to yours? If so, what were the results?
- Is the system still experimental or is it ready to go into operation now?
- How many tons of garbage can be safely and effectively handled?
- What will be done with the end-product materials? What's the nature of the markets and what are the plans if the market slumps?

For more information about magic machines, contact CHEJ.

Mixed Waste Composting: Good Idea or Quick Fix Solution?

In the wave of enthusiasm for recycling programs that is sweeping this country, a number of unusual projects that offer to "compost" different types of waste keep coming up. These projects range from "composting" sewage sludge to full scale "mixed waste" composting that offer to "compost" household and industrial garbage following some minimal removal of components from the waste stream.

This process of mixed waste composting is often described as "dirty composting" and bears no resemblance to the spirit and intent of true composting. Mixed waste composting is considered dirty because garbage generated by households and commercial businesses is commingled, mixing grass clippings, plastics, all types of paper and cardboard, food waste, disposable diapers, Styrofoam packaging, batteries and so on together. By doing this, the end product becomes contaminated with heavy metals, toxic organic chemicals and non-degradable plastics and as a result, is extremely limited and largely unusable.

The fundamental problem with mixed waste composting is that it offers a quick fix solution to a complicated problem. Garbage is picked up at the curb, the way it has always been done, taken to a plant where some of the waste is separated and the rest is "composted." Nobody has to change any of their habits, the existing waste pick-up and transport industry can maintain the status quo and the garbage problem "goes away."

But, as we are all learning, there is no "away." It was this type of quick-fix thinking that got us landfills and incinerators as "answers" to our garbage problems. We should learn from these mistakes and be wary of another "black box" solution. No system is as effective or efficient as up front source (household) separation. The critical flaw in the process of mixed waste composting is the value of the end product. The end product of any composting process is only as good as what is NOT in the original waste stream. If there is paper with inks and dyes; if there are plastics and stabilizers which are not biodegradable; if there is household and industrial hazardous waste; other metals in the waste being composted, then all these materials will end up in the final "compost" product.

If this happens, no one will want the final "waste compost" and there will be no market for it. And when you commingle commercial and household garbage, when there is no source separation, no removal of known household and industrial hazardous and toxic waste, then there is no way to avoid these contaminants in the end product. They do not disappear simply because call a process "composting."

Composting is a natural process that works best when biodegradable materials such as food, yard and wood waste make up the waste being composted. The key is to separate the organics from the inorganics. Once you start adding in all sorts of other waste materials, the quality of the compost goes down. And when toxic chemicals get in the compost, which is unavoidable when they are not separated out up front, the final "compost" product becomes virtually useless and often ends up in landfills.

A report by the New York Environmental Institute addresses these concerns. The report, "Garbage In, Garbage Out," was commissioned in response to New York State's embrace of mixed waste composting. It concludes that "the current lurch towards MSW composting is a mistake which communities will soon regret. Just as early converts to incinerators learned that the plants often did not work, presented unnecessary health risks, were prohibitively expensive and did not provide an environmentally sound solution to solid waste management, so too with MSW compost facilities." The report goes on to address compost quality, cost comparisons of MSW versus composting of source separated food and yard waste, marketing and environmental compatibility.

Another critical issue about mixed waste composting is the conflict it poses to recycling efforts. If paper, plastics, metals, glass and other recyclables are collected with the general waste stream and composted, there is little incentive for people to participate in recycling programs. As a consequence, programs designed to collect and recycle these materials will be at a serious disadvantage.

Once a community commits to an expensive management option, other competing alternatives are not considered seriously. Once a community sinks millions of dollars into one system, they want to feed all their garbage to this system and don't want to spend more money on other alternatives. Much like building an expensive incinerator, by choosing mixed waste composting, you limit the growth potential of recycling programs.

Consider, for example, what happens if you commit to a mixed waste composting facility and at the same time attempt to set up a full scale recycling program that would include curb-side pickup in some areas and drop-off centers in others. Where is the money to pay for these programs going to come from? And if the community has to borrow money to build the mixed waste composting facility, there will be pressure to use this facility to its maximum to pay the big bills and keep the town's bond ratings up.

If the recycling program is even marginally successful, it would reduce the waste going to the compost facility which would reduce its operating efficiency. In communities with incinerators where this has happened, there has been pressure to bring in out-of-state or out-of-country trash to keep up the operation of the incinerator. The same thing could happen in this situation.

There are many companies trying to solve the garbage crisis. The latest tactic by some of these companies is to use "safe" words like recycling and composting to describe their process in hopes that communities will accept them at face value. Their real intent is to confuse and fool the public. They want you to think that their process is something other than what it really is. The way to deal with this strategy is to expose it for what it is – an ill-advised method of handling garbage motivated by politics and profits not by science or common sense. Ask hard questions about the process (see box) and look critically at the answers provided by the company. You're likely to find out that very few of them can provide the information that is needed to evaluate if the system can achieve the level of success claimed by the salesperson and advertisements.

Also look at your waste management goals and priorities. How much recycling, reuse and waste reduction is occurring in your community and how much more can you do? And ask how this system fits in and how will it help you achieve your goals.

It's important to look at the track record of the company and to talk to the city or county managers in communities that are using these systems and find out if they are happy with their decision. And if it turns out that the system has not been used anywhere, then that's important to know as well.

In closing, it makes no sense to trust any system that offers a quick-fix solution to the complicated problems of managing our solid waste problems. There are no magic solutions. You need to organize your community to address these proposals and to put pressure on the decision makers.

Contact CHEJ for help on how best to do this.

Questions to ask about mixed waste composting

- What is the level of heavy metals and organic chemicals in the final "compost" product?
- What is the level of plastic, paper and other waste in the final "compost" product?
- What communities have used this system before and what was done with their compost?
- If there are other communities that have used this system, who can we contact to learn directly about their experiences with this system?
- Who pays for problems that might arise?
- Does this plan include out-of-country garbage?
- Is there a signed contract to purchase the "compost" generated by the process?

Sewage Sludge...A Dangerous Fertilizer

The land application of municipal wastewater sludge is fast becoming a major toxics issue. Hundreds of mostly rural communities are suddenly being targeted for "land farming" of sludge. In some communities like Wise County, Virginia, authorities want to reclaim strip-mined land by filling it with sludge. Other communities such as those in the Texas panhandle, in Prowers, and Kiowa counties in Colorado, and in eastern Pennsylvania have become targeted for sludge generated in New York City.

What is spurring this latest craze? It's simple. A ban on ocean dumping went into effect on July 1, 1992, sending many coastal cities like New York scrambling to find a way to get rid of their sludge. But sludge is also generated by every community that operates a wastewater treatment plant. Sludge is the end product of "cleaning" waste water, and disposal of this sludge is extremely complicated and difficult.

The theory behind the land farming of sludge is to spread the sludge over farmland to allow the chemicals in the sludge to either dilute into local groundwaters and/or evaporate into the air. This method does little more than transfer the chemicals in the sludge to groundwater and into the air and, therefore, is an inappropriate and poor method of "disposal" for sludge that contains toxic and hazardous chemicals.

Twenty years ago, when EPA first considered the idea of land farming sludge, there was some merit to the concept primarily because the constituents in sludge were mostly heavy metals. One could make the argument that some of these substances could serve as "nutrients" or fertilizer in some instances. In some circles, support for this idea has grown to the point where some believe that land farming is the ideal solution, "an environmentalist's dream come true—waste becomes a resource."

Unfortunately this view is naive and unrealistic. While in theory, if there were few or no toxic substances present in sludge, it would be possible to land farm it safely. But as a practical matter this situation simply does not exist. All sludge contains large amounts of organic chemicals, heavy metals and pathogens.

These contaminants are the result of many small (and some large) businesses that dump their toxic waste into municipal sewage lines. Every study that has tested for organic chemicals in sludge has found them, lots of them. One landmark study by the American Society of Civil Engineers clearly identified a significant number of toxic organic chemicals that are typically found in sewage sludge including PCBs, pesticides and many chlorinated compounds (see What's in Sludge).

Dr. Donald Lisk from Cornell University's College of Agriculture and Life Sciences estimates that typically 100-200 companies will flush their waste into a single treatment plant and that literally thousands of chemicals may be present in a single sludge sample. In addition, newly formed toxic substances are created as waste products break down in sludge.

Dr. Stanford Tackett of Indiana University of Pennsylvania describes sludge as being "closer to the definition of a toxic waste than it is to fertilizer." In testimony before the Pennsylvania House of Representatives, Dr. Tackett, who has studied the effects of lead on soil and groundwater for 25 years, warned that "one application of sludge adds more lead to the soil than did 50 years of using leaded gasoline" and that once sludge is applied, the soil can never be recovered.

Land farming sludge poses a number of threats. The most prominent risk is to groundwater that passes through the sludge. As rain falls on sludge, many organic chemicals are pulled into the groundwater as are heavy metals. According to Dr. Tackett, "All lead does not stay immobilized in soil as claimed." Some of it always moves from the soil to groundwater "relatively quickly." People depending on this groundwater for drinking or for livestock use and to water crops are at

increased risk of exposure to toxic chemicals.

Another threat is air emissions. Air pollutants are generated when volatile chemicals evaporate from sludge and when sludge-treated soil dries out and is carried away as dust. These pollutants pose health risks to people living downwind.

The most common concern raised about the land farming of sludge is the impact on crops grown on the sludge-treated soil. EPA has set standards that limit the amount of heavy metals and PCBs that can be applied to soil. These standards address the ability of crops to absorb chemicals when sludge is used as a nutrient or fertilizer. They do not address sludge as a disposal alternative and the potential health and environmental impacts of groundwater contamination, air emissions or the ingestion of contaminated soil by cattle or other grazing animals. The absorption of chemicals by crops is important but it is not the only issue needing attention and regulation.

A critical issue that has received little attention is the presence of organic chemicals in sludge. Few studies address the health risks these components pose and there is little test data on the extent of these contaminants in the sludge. Federal regulations also fail to address their impact. Unless sludge is tested for these substances, the health and environmental risks will remain unknown. Make sure any sludge coming into your community is tested for organic chemicals.

Another concern that cannot be ignored is the track record of land farming sludge. There is little long-term experience. There are success stories and horror stories. For example, EPA originally allowed sludge with over 100 mg cadmium per kg soil to be given to farmers and gardeners. These sludges had high zinc to cadmium ratios causing high crop uptake of cadmium. EPA was unaware of this factor until it was too late. Now crops grown in these areas cannot be used and the soil needs to be cleaned up.
In Oklahoma, nine horses died and 113 others developed liver problems eating hay grown on land fertilized with sewage sludge and in Bloomington, Indiana, PCB-rich sludge was mistakenly given to gardeners and farmers. Problems like these prompted the Del Monte and Heinz corporations to ban the use of sludge on any land used for growing their food crops. EPA has been very slow to address this issue and is reluctant to even identify sludge treated sites that need to be cleaned up.

Despite these realities, some environmental groups, including the Environmental Defense Fund, believe there can be "beneficial" uses of sludge. They argue that if toxic substances are minimized or, better still, eliminated from the waste stream, then sludge would be "clean" and could be used as nutrient or fertilizer.

Theoretically, it's possible to create "cleaner" sludge by passing toxic use reduction laws to limit chemicals discharged into sewage lines and to pretreat sludge to reduce contaminants. Some day this may be achieved, and we should strive towards this, but at this time, let's be clear, there is no such thing as "clean sludge."

Dr. Lisk agrees. He commented, "The concept of 'well engineered' sludge is a myth. There is no sound scientific basis for limiting levels of potential toxicants in sludge since we do not know the identity of most of them. Even if both of these problems didn't exist, it is extremely unlikely that any feasible monitoring and enforcement program could ensure that application regulations are met."

In the end, whether a community wants to land farm sludge is a local decision that should be made by the people who will be directly affected. No one has the right to say that land farming sludge is good for another community. The impacted community must be given both sides of the story, so they can decide for themselves what risks they are willing to accept. How can community people be expected to accept land farming sludge if the expert's can't agree if sludge is safe?

Secret Ingredients in Pesticides: Toxic Waste

How would you feel if you found out that the chemicals sprayed on your lawn included not only fertilizers and weed killers but also "inert ingredients" like xylene, chloroform, methylene chloride, toluene and other toxic chemicals? What would you say if you found out that the chemicals sprayed to kill termites or fleas in your home also contained these chemicals?

In EPA's own words: "Hazardous waste is legally allowed to be recycled into pesticides as well as other commodities under certain circumstances and on a case-by case basis." Industry has found a new "loophole" to avoid having to properly dispose of their wastes: mix them with pesticides, call them "inert" and claim to be "recycling" the waste.

In an recent interview for North Carolina's Green Line magazine, EPA press Officer Al Hire commented that allowing recycled hazardous waste in pesticides is a "way of disposing of hazardous materials." Two days later Hire retracted his previous statement saying it was a way of "using" hazardous materials.

The Greenline story also found that "not one of more than 20 EPA employees interviewed during a two-month investigation had ever heard about it [the use of hazardous waste in pesticides], even though the EPA allows manufacturers to include known cancer-causing agents in pesticides as inerts." Furthermore, the EPA "does not identify which of these chemicals are the by products of recycling hazardous waste."

For years, companies have been adding toxic chemicals to pesticide products by defining them as "inert ingredients." Inerts are "inactive" portions of pesticide products that are designed to either preserve the active ingredients, make them easier to apply or improve their killing ability. For example, some inerts soften the skin of the pest, making it easier for the active ingredient to get into the pest and kill it. Inerts tpically make up 80-90% or more of the mixture.

EPA has allowed more than 2,000 chemicals to be used as inerts in pesticides. Many of these chemicals cause toxic effects. Some are known to cause cancer. Most of them are untested. EPA must approve use of specific chemicals as inerts, but companies don't have to tell the public what those inert chemicals are.

There are two reasons for this. First, companies claim that inerts are proprietary and confidential information that should not be available to the public. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), which regulates pesticide use, prohibits EPA from disclosing what they know about the inerts. In fact, EPA employees who release any information can be fined as much as $10,000 or imprisoned for up to a year. Secondly, companies are claiming to be "recycling" hazardous wastes by adding them to pesticide products as inerts. This means they don't have to report what chemicals they add to pesticides and can avoid disposal rules for hazardous waste because they are "recycling" it. In the end, they get paid to dump hazardous waste on your lawn or in your home as the "inert" portion of a pesticide application, which is cheaper than paying for proper disposal.

It is probably not a coincidence that many waste haulers and pesticide companies are teaming up. Rollins Environmental Services, owner of 3 of the largest commercial hazardous waste incinerators in the country own Orkin Exterminators. In 1987, Waste Management, the largest waste disposal company in the U.S. tried to buy Chemlawn, one of the country's largest lawn care companies. They failed, but they do own Trugreen in Alpharetta, GA, ABC Pest Control in San Antonio, TX, Biltmore/Getz Pest Control, United Pest Control of Washington, DC and many other lawn care and pest control companies.

Waste Management spokesperson, Bill Plunkett, was quoted in the Green Line story assaying that the use of pesticide containing hazardous waste is "not necessarily a negative if it's in the form of an inert." But, how inert is benzene, toluene or xylene when it gets into your body?

Are companies like Waste Management trying to cut costs (and increase profits) by "disposing" of hazardous waste by mixing them as inerts in pesticides? Are these companies taking advantage of a loophole in the federal laws that allows them to "legally" mix toxic waste with pesticides and then spray these mixtures on unsuspecting homeowners? Just how widespread is this practice?

No one can say for sure because there are absolutely no controls over what's going on. Few people in EPA's Office of Pesticides and Toxic Substances seem to know what's going on. Making matters worse, if any EPA employee does know anything, they could be fined or jailed if they say anything. What better cover could industry ask for? If nothing is done to close this loophole, the amount of hazardous waste disposed of in this way, may top all other loopholes.

The biggest problem is the health risks. Exposures to pesticides alone can cause health problems. Add mixtures of solvents such as chloroform, toluene or xylene and other toxic chemicals to the pesticide and the health problems are going to get worse. Perhaps some of the health problems being seen now are due to the mixture of toxic chemicals with pesticides and not just the pesticides.

This is exactly what Elizabeth Iglesias from Kaufman, Texas thinks. She claims that she and her husband were poisoned by pesticides they used on their farm. Elizabeth got information from EPA that identified more than 160 toxic chemicals being used as inerts in pesticide formulations. The Iglesias' have sued the pesticide company and are awaiting the outcome of their case.

What we know is that EPA allows pesticide formulators to add toxic chemicals including hazardous waste to pesticides as inert ingredients. How much hazardous waste is getting into pesticides is unclear, but with companies like WMI and Rollins already involved in the pesticide business, one can only suspect that hazardous wastes are increasingly going to find their way into pesticides.

What needs to happen is for the public to expose this practice, to identify those companies who are doing this and stop them. The New York State Attorney General's Office recently released a report on toxic chemicals as inerts. More attention like this is needed at every level. Don't allow the school your children attend to spray pesticides on playgrounds or in the school of they don't know what chemicals are included as inerts. Don't allow private pesticide companies to spray in your home or spray your lawn unless they can tell you exactly what chemicals are being used, especially as inerts.

EPA and Congress must close the loophole that allows companies to add toxic waste to pesticides while prohibiting EPA from disclosing what they know about toxic chemicals being mixed with pesticides. People have every right to know what chemicals are being used in pesticides that are sprayed in their homes and in your community.

For More Information

- The Northwest Coalition for Alternatives to Pesticides (NCAP), P.O. Box 1393, Eugene, OR 97440 ; (541) 344-5044; or www..ncamp.org.
- The Bio-Integral Resource Center (alternative Pest Control), PO Box 7414, Berkeley, CA 94707; (415) 524-2567; or www.birc.org.
- Pesticide Watch, 1147 So. Robertson Blvd., Suite #203, Los Angeles, CA 90035; www.pesticidewatch.org.
- Pesticide Education Center (Farmworker Protection), Box 11122, San Francisco, CA 94101; (415) 731-6569; or www.pec.org..
- Pesticide Action Network, 965 Mission St #514, San Francisco, CA 94103; (415) 541-9140; or www.pan.org..

You can also contact CHEJ.

Nuclear Waste: No solutions in sight

Decades after the first full scale nuclear power station went on line and four decades after an atomic explosion mushroomed over Hiroshima, Japan, we are still searching for a place to store the lethal legacy of the nuclear age.

Many nuclear power plants are closing their doors well ahead of schedule because of skyrocketing maintenance and repair costs (see sidebar). Although the Nuclear Regulatory Commission (NRC) issues licenses to power plants to operate for 40 years, they were never built to last this long. The average life of the 20 or so reactors that have been shut down has been around 13 years.

What the NRC ignored was the equipment used to build power plants was only warranted by the manufacturer for 15 years or less. As a result, generator tubes are cracking, pipes are corroding and reactor vessels are becoming brittle. And rather than pay huge repair bills, plant owners are shutting down their reactors.

What happens when a nuclear plant is shut down? What happens to the nuclear waste generated by the plant and to the radioactive equipment? Right now, it stays right there on site. There is nowhere to take it. Most nuclear facilities are holding onto their waste until a permanent nuclear waste facility is built. As a result, every nuclear power plant in this country has become a temporary nuclear waste disposal site. Those plants that close become museums largely untouched waiting to be "decommissioned" and dismantled when a repository opens.

The basic problem with nuclear waste is that no one knows what to do with it. There's no way to destroy or detoxify it like you can with some chemical waste. Radiation will decay over time, but in most cases, this takes thousands of years. The waste from nuclear reactors, for example, will take 10,000 years to reach "safe" radioactive levels.

In the absence of a solution for what to do with nuclear waste, the NRC and Department of Energy (DOE) are trying to fool the public into believing they have an answer. With so-called low level waste, (Beware, low level does not mean low hazard. Low level waste is highly radioactive and will remain so for thousands of years. Most low level waste comes from nuclear reactors, some from industry and the rest from hospitals, medical and research centers.) The NRC has proposed classifying certain levels of radioactivity as "below regulatory concern" (BRC). This means that any waste with less than the selected levels of radioactivity (the numbers have not yet been set), could be disposed of in the nearest landfill, incinerator, water way or even sewer.

Nuclear waste watchdog groups like the Nuclear Information and Resource Service estimate that anywhere from 30-60% of the low level radioactive waste generated in this country would be exempt from regulation if BRC becomes law. This effort to linguistically detoxify low level radioactive waste is not a solution for what to do with nuclear waste. The waste still gives off dangerous radiation that enters the environment and threatens people's live.

The NRC/DOE solution to high level nuclear waste is to bury it in a "permanent disposal facility that is secure, inaccessible and well hidden." The selected site is at Yucca Mountain, Nevada. This site was designated by Congress without public input (see sidebar) leaving little doubt that politics, not science, is leading the way to making Yucca Mountain the nation's nuclear graveyard. Political problems abound because the Newah (Shoshone) people of Nevada have long claimed legal rights to Yucca Mountain and still contest the government's theft of the land.

But it isn't clear that Yucca Mountain is the right site, so DOE plans on spending at least ten years making sure it is. At the same time, they are going to start accepting waste at Yucca Mountain in a scaled down version of the large repository in what is called the

"Exploratory Studies Facility" (ESF). Congress gave the DOE $49 million in 1993 to start building the ESF.

The truth is that NRC/DOE already know that Yucca Mountain is an unsuitable site. They know the geological formations will not contain the waste and that they will never be able to retrieve it if it fails. NRC/DOE admits the site will leak and that a person living 3 miles from the site would receive "less than 1 millirem of radiation per year…" Although this estimate is small, it is based on DOE computer models full of assumptions. If you or I were doing the calculations the results would be very different.

They know Yucca Mountain won't work because it's in their own report. CHEJ recently obtained a 1983 NRC report that clearly shows that NRC/DOE are well aware that the Yucca Mountain repository will fail. The report describes inherent technical problems in being able to contain, monitor and retrieve nuclear waste placed 1000 feet below the surface in a geological waste repository.

The report, "Assessment of Retrieval Alternatives for a Geological Disposal of Nuclear Waste," prepared by Engineers International of Westmost, Illinois, evaluated 15 design concepts mostly taken from DOE plans. Technical problems included the impact of heat generated from radioactive waste on containers, the difficulty in moving "hot" waste, the release of radioactivity into air and water caused by failure of a container and the collapse of walls or ceilings of storage rooms. The report doesn't even go into more fundamental problems with the site which has seen a fair share of earthquakes and volcanic eruptions. 10,000 years is a long time.

This report provides the agencies all they need to know about the Yucca Mountain site. It won't work and they know it. Yucca Mountain probably won't last 50 years, let alone 10,000 years. Yucca Mountain is a disaster waiting to happen and NRC/DOE know it.

But NRC/DOE are moving forward anyway. Why? One reason could be the huge amount of money going to the agencies to study this site. Already $1.4 billion has been spent on Yucca Mountain. In 1993 alone, Congress gave DOE $245 million in fiscal year 1993, up from $182 million in 1992. One billion dollars can buy a lot of job security and keep a lot of government staffers and consultants happy and quiet. Another factor could be the pressure from the nuclear industry which needs a place to put its waste. They have enough influence, power and money to get DOE and NRC to take care of their problem.

Nuclear Power Plants Dying Young

One by one nuclear power plants in this country are prematurely closing their doors. The reason is simple, it costs less to shut them down then pay enormous repair costs. In January, 1993, the Trojan nuclear power plant in Rainier, Oregon, closed down 18 years ahead of schedule rather than pay $200 million to replace cracked tubes in its steam generator. The San Onofre Unite 1 near San Diego closed with 12 years left on its operating license rather than pay $125 million for needed repairs. The oldest power plant in the country, the Yankee Rowe, in Rowe, Massachusetts, closed in 1991 because the owners did not want to spend $23 million to repair its aging reactor. Plants near Suffolk, New York, and Platteville, Colorado all closed in 1989 for similar reasons.

Getting to Yucca Mountain

In 1982, Congress passed the Nuclear Waste Policy Act making DOE responsible for locating, building and operating a permanent underground disposal facility. To pay for the research and siting of this facility, Congress established the Nuclear Waste Fund. Companies who generate nuclear waste pay into the fund. In reality, you and I pay into this fund because utilities that buy electricity from nuclear power plants simply pass this cost on to the consumer.

However, DOE made no progress in finding a suitable location largely due to public and community opposition. So, in 1987, Congress amended the Nuclear Waste Policy Act and directed DOE to study only one site located at Yucca Mountain, Nevada to determine whether this site was suitable for a permanent repository. And if the site is found to be unsuitable, studies will stop immediately. According to DOE, "if that happens, the site will be restored to its natural condition and DOE will seek new direction from Congress."

For a copy of the executive summary of the NRC report (21 pages), send an email to CHEJ. In the meantime, get the word out about Yucca Mountain and NRC. Don't let NRC/DOE fool you into believing they have a solution to nuclear waste. The reality is that we have failed to come up with a way to adequately isolate and contain nuclear waste. The Coalition on West Valley Nuclear Waste advocates putting nuclear waste in above ground monitored facilities "to emphasize to each generation its responsibility to monitor these waste for its own protection and that of future generations." We can also stop using nuclear power which is the primary source of nuclear waste.

From Pollution to Prevention

From Dr. Barry Commoner's keynote at Grassroots Convention '89

For 20 years, this country and the world have undertaken to clean up the environment. Billions have been spent and we have to ask ourselves, "what good has it done?" The answer is embarrassing: We have failed to clean the environment. How do we know that? Because the numbers tell us.

But if you look at some pollutants, we have accomplished what the regulations intended, which is reduction! DDT is down in the air by 90%. PCB's are down about the same percentage as DDT. Strontium 90, by 20 fold. If you look at the attempt to clean up the environment, most pollutants have shown no change or gotten worse, while this handful has improved.

We now see what worked and what didn't work. Why is lead down? Because we have taken it out of gasoline. Why are PCBs and DDT down? Because they've been banned. Why is Strontium 90 down? Because we and the Russians have had the good sense to stop blowing off the bombs that produce strontium 90. I'll give you a new law of the environment: If you don't put something into the environment, it's not there.

Pollution "control" doesn't work. Not only has control failed to clean up the environment, but it has eroded democracy. When you try to control, you allow pollutants in the environment. Then EPA goes to work on regulations to set some "acceptable" level of pollution that is OK. However, that is not what the National Environmental Policy Act says: "The purpose of this act is to prevent and eliminate pollution."

When that "acceptable" pollution is reached, it will never go lower. Do you suppose that Dupont, and Monsanto, if they get to that standard, are going to call a board meeting and say, "Fellahs, we done a good job, why don't we go lower?"

Then you have to figure how we get those "acceptable" standards. Cost benefit. The hazard is measured in people's lives, people killed. There's this huge new academic profession based on the idea of putting a dollar value on people's lives. One of the ways to believe that the earth is a divine creation of God and he made us stewards of it in the end. We have important work to do.

The Bible says that harvest is great but the workers are few. It is said that door knocking is the divine plan for spreading the gospel. Door knocking is one our most effective tools that we have in our communities. It is at the point of community that God empowers us.

At a recent meeting in Michigan, I heard a citizen say it was nice to get to know the neighbors through the door knocking that they did about a proposed site. She said she would not have gone to their homes normally, but God gives us strength. I get empowered by people in the Movement. The Movement is where the hope is. The cause of sacrifice is great for all of us.

The EPA is hoping that we will be so concerned for our situation that we won't have concern for those in other states. I recently got a call from a woman in Bloomington, Indiana who told me that about 7 or 8 truckloads of waste going from her site to Emelle, ALabama. She was crying. She didn't know about 7,000 truckloads of waste coming from another site in Indiana to Emelle, Alabama. But I was very moved by her call. So now we are struggling to see what kind of wastes are produced in our state and trying to keep them from being sent elsewhere.

There's a lot of plans coming up. Lots of groups are going to be at EPA regional offices to demand a stop to incinerators and landfills, demanding that state capacity assurance plans include citizen participation. Soon, before Earth Day, citizens will be meeting with polluter companies to get them to sign good neighbor agreements.

You know what, I don't think the EPA is ready for us. It's so wonderful to be here and speak. It's a dream come true. Thank you, Lois. Meeting all of you, I have such warm feelings. I'm so happy to speak to a friendly group of people from a change, because, usually, we're beating up on EPA.

Thank you so much.

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Waste Reduction…A Better Way to Go

You're against everything! Landfills, incinerators, deep injection wells, land farming. What are we supposed to do with the stuff? It's got to go somewhere!

Are you tired of this senseless and hopeless argument? It doesn't "have to go somewhere" if the people who generate hazardous wastes and those who regulate its disposal decide to stop trying to build a better landfill or incinerator and instead put their resources and energy towards the best alternative of all: not producing waste in the first place. While this may put some very close friends of EPA out of business, and it may cost more money (in the short run) to achieve, the technology to reduce as much as 80% of what is now disposed of is available today. And the prospects for future development and the new applications of old techniques is an inventor's paradise.

Waste can be reduced right at the source, at the plant where it is generated. This is often referred to as source reduction, waste reduction; waste minimization or volume reduction. There are essentially 4 ways to do this:

1) Process Changes - These are changes in design and/or operation that reduce the generation of wastes. This can include changes in raw materials, reaction conditions and procedures, and retrofitting or replacing old equipment. Traditionally, industry has only considered making process changes to save money (or increase profits). Yet these same techniques and approaches can be used to generate less waste. Most process changes are plant-specific and are not applicable industry-wide.

2) Source Separation simply separates hazardous mixtures, thus reducing the amount of wastes requiring disposal. The segregated waste mixtures can then be recovered or recycled. An example is the removal of toxic metals from metal rinse waters. This is the simplest and least expensive waste reduction method.

3) Recycling and Reuse involves reusing waste following treatment or recovery. The simplest application is reusing a waste from a process directly as a raw material in that or another process. The most common type of recycling is of waste solvents, using a process called distillation to separate and collect solvents evaporated at different temperatures. Clean solvents are separated from impurities and recycled. Recycling can be done in plant or between different companies. Waste exchanges help identify and match waste generators with users (see Baffled by The Terms).

4) Material Substitution involves replacing a hazardous substance used in a process with an non-hazardous substance, such as substituting solvent-based inks with water-based inks.

Other methods which can reduce waste generation include:

- Conducting a waste audit to identify where material and contaminant losses occur, and where waste reduction opportunities exist.
- Increasing housekeeping habits so that less waste is generated.
- Replacing old inefficient equipment.
- Concentrating waste, thus reducing the volume of waste needing treatment or disposal.
- End-Product substitution, where products which generate significant quantities of hazardous waste are replaced by products that don't (such as replacing asbestos pipes with clay).

These waste reduction methods have been successfully applied by many companies, the most successful of which is probably 3M. 3M credits saving of $845,000 a year to a process change in their sandpaper manufacturing operation resulting in a waste reduction of 400 tons/year. These and other waste reduction success stories have been carefully documented in books

such as Pollution Prevention Pays, which shows that industry can save money while reducing generated wastes, and thereby decreasing environmental damage and reducing public health risks.

These efforts will hopefully help industry recognize that waste reduction is not too costly, is technically feasible and is in their own best interest. Industry benefits from reduce waste transport, storage and disposal costs, reduced pollution costs, reduced liability, energy savings from more efficient production processes and less testing and record keeping requirements. At the same time, society benefits from less environmental damage, reduced public health risks, less pollution, and the conservation of resources and energy.

Waste reduction is a waste management strategy that few, if any, can argue with. Why not start in your community with any waste generators or plants that handle hazardous wastes? Adopt ordinances or policies that encompass waste reduction methods before ANY other disposal methods is even considered. Encourage industry to use these methods and pat them on the back when they do. Support people like Huising who are actively encouraging use of these methods. And, most important, ask your state and local governments why they're not using or encouraging use of these methods. They need to know what you think and why.

It's time for government and industry to stop dealing with the problems of toxic chemicals by trying to find ways to get rid of what's left after a product is made, and to start looking at the whole process in order to minimize the waste that is generated. This is one instance where the old saying, "An ounce of prevention is worth a pound of cure," couldn't be more true.

For more information:

- Proven Profits from Pollution Prevention, Case Studies in Resource Conservation and Waste Reduction, Dr. Huising et al. Available from Institute for Local Self Reliance, 2001 S Street NW, Ste. 570 Washington, DC 2009.
- Profits from Pollution Prevention, A Guide to Industrial Waste Reduction and Recycling, M. Campbell and William Glenn. Available from Pollution Probe Foundation, 150 Ferrand Drive, Suite 208 Toronto, Ontaro Canada M3C 3E5.

Baffled By the Terms

Distillation - A process by which liquids are heated to produce gases. These gases can then be separated and collected separately by condensing the gases to form liquids again. The separation step is possible because of the different boiling point of chemicals. As the original liquid is heated, different chemicals will boil at different times and their gases can then be collected separately.

Housekeeping - General in-plant cleaning and maintenance of equipment which reduces chemical losses due to spillage, leaks or pollution. Good housekeeping practices will also reduce workplace exposures, plant emission, and the amount of waste generated by a plant. This is one of the easiest waste reduction methods to implement.

Reclamation - The recovery of a useable product from waste following extensive pretreatment.

Segregation: A system of keeping waste streams that are generated by difference processes separate. Good segregation systems enhance materials recovery as well as energy and heat recovery.

Waste Audit - A thorough analysis of a company's processes and waste that generates detailed information on the type and quantities of wastes that the company generates. Completion of an audit identifies problem areas and provides baseline data needed to determine the potential for waste reduction and to establish a waste reduction program.

Waste Exchange - The transfer of either information concerning waste materials or the waste directly from one company to another. In order to do this, the user must find the waste generator. This matching can be achieved by a general clearinghouse which provides information about materials and services or by a broken who gets directly involved in the negotiation and often directly handles the wastes. Waste exchange is essentially a form of recycling between companies

Chapter 5

Cleaning up Contaminated Sites

Cleaning Up Dumpsites: what are your options?

A community in Massachusetts received a Remedial Investigation Feasibility Study (FI/FS) out lining 11 "options" for cleaning up a dumpsite. One was to "do nothing," (hardly an "option"), one was to remove the wastes to an offsite landfill, and the other nine involved onsite landfills: one was two bottom liners and a clay top; another with one bottom liner and a clay top; two liners on top, one on the bottom; two on top, two on the bottom; and so on.

EPA was quite satisfied that the community was being given a lot of choices. In reality though, what were their options? A landfill, a landfill, or a landfill. The residents were first confused and then mad when they realized a landfill was their only choice.

When you review cleanup options at your site, keep this in mind: are the options really different? Or are they only slight variations of the same idea?

When selecting cleanup options, EPA does a Remedial Investigation (RI) Feasibility Study (FS) evaluating the characteristics of the site, extent of contamination, costs of technologies, and regulatory constraints and requirements for Superfund. The RI, generally a 300-page report focuses on data collection and site characterization; the FS, usually 100 pages, focuses on data analysis and evaluation. Despite the dependence of the FS on results from the RI, EPA conducts both simultaneously. So the feasibility of different options gets evaluated early in the process. By the time the FS is given to the community, EPA has already decided what options are best! EPA then gives you three weeks to comment on a report that may have taken them three years to develop! But you can demand more time - two or three weeks extensions have been granted to groups across the country who asked and applied a little pressure.

In the end, EPA selects an option based on "cost-benefit analysis." But the most "cost-effective" cleanups are often not the best cleanup for a site. You can influence that decision if you organize and send a clear message to EPA: we will only accept the best for our community.

What are the Options?

There are primarily four cleanup options: onsite

containment, onsite or offsite treatment, removal and storage.

Containment Technologies attempt to stop the movement of contaminated groundwater and isolate contaminated soil. Leachate generated when wastes come in contact with water must be collected and treated. Containment methods do not destroy or inactivate harmful wastes. So contained sites must be monitored indefinitely.

Containment techniques include groundwater pumping, groundwater barriers (slurry walls and grout curtains), underground tile collection systems, encapsulation/fixation techniques, surface water controls and surface seals such as clay caps or plastic liners. Which methods should be used depends on specific site factors such as groundwater flow patterns, bedrock fracturing, erosion, slopes and rainfalls. Containment technologies have been used for years in traditional construction engineering but have no long-term performance record for effectiveness at dumpsites.

According to the Congressional Office of Technology Assessment (OTA), "there is little data available to support the view that containment technologies are reliable or proven for use with hazardous wastes." OTA actually provides details to the contrary; raising concern that, at best, these methods only delay the need for more effective cleanup!

Treatment Technologies reduce the toxicity of contaminants by either destroying the characteristics that make the chemical hazardous or by immobilizing the contaminants. Treatment technologies include biological, chemical, physical and incineration process. Which one you pick depends on specific properties of the waste.

All these methods produce a residue which must be disposed of (and perhaps additionally treated). Some treatment methods simply shift risks from one point to another. For example, incineration creates air pollution risks.

Removal methods simply excavate wastes and transfer them to another site, for either treatment or land disposal. EPA has used this technique extensively at Superfund sites, transferring risks from one site to another: the "Toxic Merry-Go-Round." This method accomplishes three things: (1) it gives another community your problem; (2) it makes the waste disposer very rich and guarantees him perpetual employment; and (3) it takes care of only some of your problems.

Storage techniques are temporary methods which hold wastes until better techniques are available to permanently destroy them. Storage methods include bunkers, tanks, vaults or possible above ground landfills. Storage techniques were being used at Times Beach, Mo, and were considered at Love Canal, NY, where EPA considered an above-ground cement storage bunker the size of three football fields.

In the Superfund program, more than 95% of cleanups involve either containment or removal of the waste. Often several technologies are used together, such as groundwater treatment with containment. Only 1% of 395 sites have used technologies that destroy wastes (primarily by incineration). As a result many sites will still need cleanup in the future.

The only way to avoid this is to permanently destroy wastes. Do such technologies exist? YES! OTA describes 26 being developed by private industry in a recent report. Some are already being tested at different sites. EPA is not likely to use these technologies, however, because of their reluctance to try something new and because Superfund regulations require the use of "proven" (existing) technologies.

You can influence EPA's selection of a cleanup option. EPA won't exactly welcome you as a participant, but they will listen to you if you speak strongly enough. EPA responds to the squeaky wheel. The key is developing a strong community organization with a loud and strong voice.

For more information on cleaning up contanminated sites, contact CHEJ.

How Clean is Clean?

There have been many heated discussions on the issue of how clean do you clean up a hazardous waste site—what is an "acceptable" risk? And secondly, where should that level of clean-up (risk) be achieved. CHEJ surveyed over 200 community groups and asked them what would be acceptable to their group. The options that are being discussed are as follows:

Use of Standards or Risk Assessment to Develop a Baseline

The baseline approach defines the level of chemicals allowed to remain on-site in the impacted area. The first step requires establishing "acceptable" or "safe" levels of chemical exposure. Currently ambient water quality criteria and safe drinking water standards have been suggested but additional standards are need for chemicals not on these lists. Another alternative is to use risk assessments to determine "acceptable" risk levels.

Once established, this exposure level would be allowed to remain anywhere in the community beyond the property line. Inside the property line levels could be higher because a mathematical model is used to "predict" how much waste could be left on site without exceeding the exposure standards at the property line. In other words, clean up only goes as far as the model predicts that the exposure standard is not exceeded at the property line.

Using this approach could likely result in significant quantities of chemicals being allowed legally to remain in the environment. For example, let's assume the standard for benzene is 10 parts per billion (ppb). Benzene is known to cause cancer and other disease in humans and evaporates very easily. Using this model, clean up would involve only removing benzene to 10 ppb. People could thus be exposed to benzene at this level 24 hours a day if their property, air or water was contaminated by this compound. In the case where we know nothing about a particular chemical's affect on people, a safe standard could not even be developed. Where communities have hundreds of chemicals with little or no information about their toxicity, clean up would only go as far as required to clean up a chemical for which there is a standard.

Zero Level

The second clean up approach is simple: clean it up to the point where no compound can be found at all. The argument here is that is it not achievable since clays and other soils have heavy metals such as arsenic or lead that are naturally occurring in the environment.

Background Level

The background level approach required reducing contaminants to levels that are comparable to a similar or "control" area that is not affected by a toxic waste problem. This would include identifying a control area, sampling that area, and then use the levels found there to establish background levels. If the background levels are high, then either a risk assessment is done or another control area is defined. There are advantages and disadvantages to all three approaches. CHEJ has written these up in two papers which were distributed to the community groups and are available to others who are interested upon request. After reading these papers the community people surveyed expressed that they would support the background level (87%) at their site. In the second survey, we asked where this level should be achieved: at the center of the site, the edge of the site or the edge of the property line. Eighty-one percent (81%) indicated they wanted the level achieved at the center of the site primarily because the other options would only contain the wastes and never permanently clean them up.

For more information on setting cleanup goals for contaminated sites, see CHEJ's guidebook How Clean is Clean.

Safety Plans
What Makes A Good One?

The most important aspect of the cleanup is the safety plan. This plan lays out how workers and the community will be protected during clean-up. You need to be involved in developing it so it addresses your community's needs before any construction begins.

They Say Our Fears Are Unfounded

The first thing you'll hear is "A good on-site plan is a good off-site plan." If workers aren't exposed, the community will be protected. Not true! Workers on-site have protective gear and go home at night. You don't. Further, in case of an accident, you can reasonably expect that workers will attend to themselves and their co-workers first. You're on your own! You're also going to be told that your fears are unfounded, " It can't happen here." This isn't true either. What magic formula do they have for your site that no one else has? Blanket assurances are pretty irresponsible. Accidents do happen, and a proper plan is needed to prevent disaster.

What Are the Risks?

Lot of things can go wrong during cleanup: Chemical releases; explosions when barrels with explosive chemicals are struck; releases of volatile chemicals exposed to air; vehicles tracking contamination off-site; dust blown by the wind and wastes washing off by rain. A good plan addresses each of these and relies on good information. Here are some key questions:

- What's buried at the site? Are the wastes explosive, flammable, corrosive, reactive, volatile or stable?
- Do these chemicals move through groundwater, surface water or soil? Do they stick to soil that's going to become wind-blow dust? Will the presence of other chemicals change their behavior (e.g., dioxin will move if organic solvents like benzene or toluene are present)?
- Will waste react to sunlight, water, air or other chemicals? Dioxin, for example, will slowly break down in sun light while MIC (the chemical killer in Bhopal) will create a toxic cloud if mixed with air.
- Are the wastes in barrels, special containers or just emptied in the ground?

What Should Be Included in the Safety Plan?

It depends on the wastes at the site, and the cleanup plan. For example, if the plan calls for excavation and removal, you'll need more details than if they were just topping it with a clay cap. General ingredients for a good safety plan include the following:

- Safety Coordinator - Someone responsible for implementing the safety plan, coordinating the emergency team, activating contingency plans, reporting on-site activities to the general public and maintaining a constant link with the safety officer.
- On-site Safety Officer - Ensures the safety plan is carried out, notifies coordinator and emergency response personnel of all dangers and problems and "sounds the alarm" for workers and the community.
- Limited Access to the Site - Keeps unauthorized individuals out and avoids contact by the public with the contamination.
- Real-Time Air Monitoring - Provides quick (within several minutes) air test results. This requires a special mobile lab equipped with a toxic vapor monitor to measure total organic halogens or an infrared spectrophotometer (IR) to measure chemicals like benzene, toluene and chloroform.
- Temporary Evacuation Plan - For sensitive people with respiratory problems that could be aggravated by even small exposures.

More situation-specific measures could include:

- Careful dust control.
- Cover all excavated spoils (contaminated soil) and trenches at the end of each day.

- Restrict on-site vehicles to reduce spreading toxics beyond the site.
- Clean all vehicles before they leave the site.
- Designate specific "clean" staging areas where materials and supplies could be delivered without coming into contact with contaminated soil.
- Maintain equipment on-site for as long as needed (avoids cleaning equipment more than once.)
- Use berms around work areas to prevent runoff to clean areas.
- Place charcoal or lime piles close to trenches to quench fires or neutralize chemicals.

Compare these measures against the safety plan for your site. How close they come depends on the situation and on you. It's up to your group to make sure these safeguards are built into the safety plan to protect your community as well as the workers. Plans should address every reasonable fear and concern. Be prepared for the unexpected and take nothing for granted. Remember the old saying: "an ounce of prevention is worth a pound of cure."

For more details on safety plans, contact CHEJ.

Innovative Technologies—The Future is Now

Has EPA told you that their clean-up plan is "proven technology," but that it will take 30 years to do the job? That it's the "best we can do"? That it's the "most cost-effective cleanup remedy"? Well, none of that's so. EPA's cleanups, using mostly containment methods, are destined to fail, sending EPA back to the same communities to clean up the same sites again. Why? Because containment systems aren't proven technologies (except "proven" to fail) and because the wastes are still in the ground, slowly working their way out. But this does not have to be the case. There exist today technologies capable of permanently destroying hazardous wastes.

CHEJ found this out first-hand when we held a Roundtable meeting on Innovative Technologies for Destroying Hazardous Wastes. Nine companies gave presentations describing different innovative technologies capable of treating and destroying hazardous wastes at the waste site. A number of important points were brought out:

- Technologies to permanently destroy and cleanup waste sites exist and are available today.
- EPA is a major obstacle to the use of these new technologies.
- Most methods are mobile and can be used to cleanup waste sites or reduce wastes at the plant where they are generated.
- One technology alone will not likely be enough to clean up a waste site. In most cases, it will take a combination of methods.
- Cost is the biggest single obstacle to use of these technologies.

Generally, innovative technologies use existing science or engineering in a way that hasn't been tried before. In other words, most new technologies aren't new breakthroughs. Rather, they're innovative changes in existing processes or methods. Some new technologies actually don't destroy contaminants. Instead, they improve on separation methods, providing an important pretreatment step that makes it easier to use other technologies.

Innovative technologies are important if they (a) control pollutants not currently controlled; (b) provide control beyond what's available with existing technologies; or (c) increase reliability or cost-effectiveness of the cleanup.

Classifying Innovative Technologies

Innovative technologies fall into 4 general categories: (a) thermal destruction; (b) chemical treatment; (c) physical treatment; and (d) biological treatment. Some innovative technologies do not fit neatly into these categories. By the very nature of being innovative, they may need a category of their own.

Thermal Destruction Methods

Most innovative thermal destruction methods use high temperatures (800-3,000 °F) to break down organic chemicals into simpler, less toxic forms using systems both with oxygen present (incineration) or without oxygen (pyrolysis). Several examples are described below:

Plasma Arc Torch. Developed by Plasma Systems, Inc. of Ontario, Canada and marketed to the U.S. by Westinghouse Corp. Plasma arc destroys liquid waste by passing it through a high voltage electric arc in a chamber that resembles a giant sparkplug. Temperatures that reach 15,000-30,000°C vaporize chemicals in seconds, breaking chemical bonds. As the waste stream cools, elements recombined into harmless gases (hydrogen, hydrogen chloride, carbon monoxide, carbon and methane).

Infrared Incineration. Developed by Shirco Infrared Systems, Dallas, Texas. This system burns wastes in an infrared furnace at 500-1,800°F. It destroyed 99.9999996 percent of the dioxin in soil from Times Beach, Missouri.

Advanced Electric Reactor. Developed by Huber Corp. of Borger, Texas. This system heats waste to 4,000°F by electricity, not combustion. A "blanket" of nitrogen keeps the waste away from the reactor walls, while thoroughly destroying them. Removal efficiencies are reported to be 99.9999 percent in all cases. This system was used to destroy dioxin in soil at Times Beach, Missouri.

While innovative thermal destruction methods offer improvements over conventional incineration methods (such as ways to maintain adequate temperatures and increased mixing and residence times) questions remain about emissions and residues, including how completely the processes will destroy the waste and any by-products that are generated.

Chemical Treatment Methods

Chemical treatment methods change chemicals by destroying their hazardous elements or by producing new compounds that are easier to further treat or dispose of. These methods usually only work when a single chemical is involved (or a few with similar properties). When applied to mixtures of several wastes, side reactions interfere with the desired reaction, reducing effectiveness. Examples include:

Supercritical Waste Oxidation. Developed by MODAR of Natick, Massachusetts. This system uses the unique properties of water heated under pressure to destroy bonds that hold chemicals together. Removal efficiencies range from 99.99-99.9999 percent for dilute liquid chlorinated hydrocarbons.

Catalytic Dehalogenation. Developed by GARD Corp. of Niles, Illinois. Chemical reactions break the bonds holding halogenated (containing chlorine, fluorine or bromine) chemicals together.

Physical Treatment Methods

Physical treatment methods use differences in physical properties (particle size, density) to separate waste components without altering chemical structures. Usually, hazardous components of the waste are concentrated while the non-hazardous components are separated as liquid or solid.

Physical methods don't destroy wastes; they change them into forms that are easier to treat further or dispose of. Examples include:

Vacuum Extraction. Developed by Terra Vac, Inc. of Puerto Rico. This system uses pumps to extract chemicals from soil in the region above the water table. Extracted chemicals are then treated on-site.

K-20. Developed by Lopat Industries of Wanamass, New Jersey. K-20 is primarily a surface sealant which penetrates walls and traps pollutants inside the treated surface. It can be used to "encapsulate" solids.

Biological Treatment Methods

Biological treatments use either naturally occurring or synthetic (genetically engineered bacteria to break down or "eat" chemicals. The bacteria may be applied directly on contaminated soil, placed in ponds, lagoons or holding tanks or added to groundwater, depending on the process.

Biological treatment is not new. It has been used on municipal wastewater for many years. Its application to hazardous wastes is new and raises many questions. Factors such as temperature, soil type, strain of bacteria, amount of air and waste present influence the effectiveness of naturally occurring organisms, but these factors can be controlled. With genetically engineered bacteria, many more factors influence effectiveness (such as mutant growth and adaptability to real world conditions), many of which cannot be controlled.

Bacterial systems have been developed by many companies including Groundwater Decontamination Systems of Paramus, New Jersey, Detox Industries, Stafford, Texas and FMC Corp of Princeton, New Jersey. Other promising techniques include White-Rot-Fungus developed at Michigan State University and Microbial Plant Filtration developed by NASA.

New technologies offer considerable promise for the future. However, few have been used at contaminated sites, even today. EPA has simply not supported the development and application of new innovative technologies.

If you dont like what EPA is proposing to use at your site, ask questions, ask about the availability of treatment technologies that can permanently destroy the chemicals at your site. Don't accept EPA's likely quick response that there are none or that those that exist are not appropriate for your site.

And if you do identify a new technology that might work at your site, ask questions (see box), be critical and don't ignore common sense questions about safety or effectiveness just because something is labeled "innovative" or "new."

Innovative technologies are not a cure-all. They will not solve all our hazardous waste problems. At present, many problems and questions (such as the degree of reliability and effectiveness) remain. Despite this, these technologies offer hope that we can avoid the the disastrous practice taking waste from one site to another and the equally disastrous use of containment methods to "cleanup" waste sites.

More than 40 technologies are described in CHEJ's publication Advanced Treatment Technologies for Disposal of Hazardous Wastes. This guidebook also describes barriers to the use of new technologies and strategies to overcome these barriers. Copies are available from CHEJ.

What you can do to identify new treatment technologies for your site

One strategy to consider is holding a conference that brings companies with new technologies to your community. The Pitman Alcyon Lake Lipari Landfill Community Association (PALLAC), representing residents living near the Lipari Landfill, did just that. Dissatisfied with EPA's proposed cleanup plan (estimated to take at least 15 years), PALLCA invited five companies with technologies that they felt would work at Lipari to their community. The meeting was attended by community leaders, state and local officials, regional EPA staff and others. The meeting was a big success as alternative technologies were identiifed that EPA had not considered. The conference organizer, commented, "I think there were a lot of people who were amazed at what they heard. If we continue laying the pressure on, we will win the fight for a safe, clean environment. They will listen to us if they are made to listen.

Questions to Ask About New Technologies

The following is a list of questions you should raise regarding any new technology:

- How does the process work?
- How completely will the process destroy the waste?
- What waste products, air emissions or residues are produced during the process? How are these disposed of?
- What new products, if any, are produced during the process? If new products are formed, has their toxicity been tested?
- What wastes can be destroyed by the process? What wastes cannot be destroyed?
- What is it that makes this particular technology better than existing available technologies?

- What is the best and most applicable use(s) of this particular process?
- Has the process been used at waste sites or industrial plants around the country? If so, what were the results?
- How mobile is the process? How easy is it to set up and dismantle at a specific site?
- What is the stage of development of the process? It is ready for use at waste sites?
- How does the cost of using this process compare with the cost of methods currently used by EPA?
- What are the barriers to using this process?

Chapter 6

Drinking Water

Testing Drinking Water—What Do You Look for?

You believe there may be toxic chemicals in your drinking water. The water tastes funny and your boiled potatoes turn a odd shade of grey. You asked the government to test the water, but they refuse. Now what can you do? How to get your water tested for chemical contamination is unfortunately becoming an increasingly common problem. How do you go about it? Who should do the testing? What do you look for? Here's some advice based on our experience.

How Do You Go About Having Your Water Tested? Who Should Do the Testing?

You have basically 4 options: have the water tested yourself; hire someone to test it for you; pressure the government to do it; or pressure the party responsible for the contamination to do it. Which option is best depends on your individual circumstances. Mostly, it depends on who can give you what you want - a reliable test with believable results.

If you test the water yourself, you run into a credibility problem: your opponents can say you "spiked" the sample with cleaning fluids or other chemicals to "prove" that the contamination exists.

The only way to overcome this credibility gap is to have someone else test the water for you, but this can cost big bucks. Also, if you don't know what to specifically test for, then the testing costs go up and up. Try to contact someone at a local university or college that has a chemistry laboratory. Striking up a relationship with someone in the local chemistry department could yield first-rate results with minimal financial expense. Pressuring the responsible party is good but only if you can identify who's responsible. Your last option is pressuring the government.

What Do You Look For?

This depends on what is causing the problem. Where are the contaminants coming from? If it's a landfill, you need to find out what's been buried; if it's a gasoline station, then you need to look for oil and gasoline constituents; if it's a local factory or manufacturing plant, you'll need to find out what is made there. However, in most cases, you won't know what the source is, or as is the case with most landfills, even what the wastes are. So now what?

Government agencies, with limited experience in the area of hazardous waste, and with limited resources tend to look for "traditional pollution parameters," including PH, specific conductance, turbidity, chlorides, and a list of metals.

These traditional parameters, however, do not reflect the diversity of potential environmental pollutants that could be leaching out of a land disposal site into your drinking water.

In addition, these indicators of general water quality can have seasonal changes in concentration that are unrelated to leachate migration. If these "traditional pollution parameters" are the only measures used to evaluate your water, "evidence" of contamination (with exception to the metals) is unlikely to be found. These measures were originally designed to test only for problems stemming from sanitary landfills or from bacteria and were intended only to set minimum standards for public drinking water systems. They were never intended as limits for acceptable environmental contamination.

So, what else do you want to look for? EPA suggests looking at general "screening" compounds that are indicators of contamination: total halogenated organic (TOX), total organic carbon (TOC), pH and specific conductivity. These measures, however, are too general to serve as any more than an early warning of threats to public health or the environment.

The reason for this is because this approach ignores the fact that chemicals hazardous to human health can migrate selectively into drinking water at concentrations far less than what the indicator parameters can detect. For example, while the concentration of total organics may not be very high in a sample, if a specific organic such as benzene or toluene, make up a significant portion of the sample, there would be a substantial health risk which would be overlooked.

Furthermore, the "sensitivity" of the tests to measure TOX or TOC is not very high when compared to individual specific chemicals. In fact, testing for TOX and TOC requires 1,000 times more contamination than looking for specific chemicals because of the high detection limits of these indicators.

The best approach may be to look for a group of chemicals called "priority pollutants." Although all toxic chemicals are not on this list, most of the "bad actors" are, and testing for the priority pollutants may be the most comprehensive and practical method for determining what is in your water.

Deciding what to test for and how to do it is not a simple task. Ideally, you want to get the most information for the least cost. The trick is knowing what to look for and how and where to look. You can't find contamination in a water table 10 feet below the surface if your sampling probe only goes down five feet. If you need help in deciding what tests to request, or in interpreting test data contact CHEJ.

Is Bottled Water Enough?

By Beverly Paigen, PhD.

What happens when your well water is contaminated with toxic chemicals? To "solve" the problem, public health officials often recommend or provide a source of bottled water for the family's drinking and cooking. However, the contaminated water is still used for washing dishes, washing clothes, baths, and showers. Are these activities an important source of exposure to the toxic chemicals? A person taking one 15-minute shower can get more than twice as much chemical from the air during those 15 minutes as from drinking all liquids consumed during the day from contaminated water.

This alarming fact can be illustrated by measurements made at a home in Gray, Maine, where chemicals had seeped from a nearby chemical dump into wells. The well water measure 1.8 parts per million trichloroethylene (often called TCE for short). State officials turned on the hot shower and shut the bathroom door. Fifteen minutes later they measure the amount of trichloroethylene in the steamy bathroom air. Calculating the amount of liquid a normal adult consumes during the day and the amount of air adult breathes in 15 minutes showed that 2.700 micrograms (ug) of TCE would enter the body from drinking contaminated water all day and 6,700 micrograms of TCE from breathing contaminated air for 15 minutes. That means that over 70% of the daily intake of TCE from contaminated water came from a shower.

There is an even more dramatic example of this phenomenon. In Hardemann County, Tennessee, local groundwater became contaminated as a result of chemical wastes leaking from a landfill. In 1978 numerous organic chemicals including benzene, chloroform, TCE, and carbon tetrachloride were detected in private wells serving the local residents. Carbon tetrachloride levels ranged from 61-18,700 ug/liter (equivalent to parts per billion or ppb). Most residents ceased using the water for drinking and other domestic uses. Concerned that exposures might have continued, a team of researchers conducted a series of air tests inside several homes. One of their most surprising findings was that bathroom air levels of carbon tetrachloride increase from 23 to 3,600 milligrams per cubic meter (mg/m^3) following a 15 minute shower! This result combined with other indoor air levels of toxic chemicals prompted the researchers to conclude that exposures of toxic chemicals did indeed continue after the residents stopped using the water for drinking purposes. Bottled water is not enough!! A home with contaminated well water must be provided with clean water for every use. This is especially important for volatile, that is easily evaporated, chemicals like TCE.

If your well is contaminated and you don't have a source of clean water for bathing yet, what can you do? The most important thing is to organize the community as a group and insist upon your right to clean water. Until you get it, protect yourself and your family by taking baths rather than showers and by having an open bathroom window during the bath. The amount of chemical that volatilizes, or evaporates, from contaminated water depends on two things – the temperature of the water, and the size of the surface that the evaporated chemical can escape from. The warmer the water, the more chemical that will evaporate. The greater the surface area, the more chemical that will evaporate. One cup of water in a coffee mug will not have as much TCE volatilize as one of water broken up into hundreds of tiny drops as in a hot shower. So baths rather than showers should be the rule until you get clean water. To reduce your exposure further, fill the tub with very hot water and let it stand with the bathroom door and window open until the water cools to the right temperature. This will allow some TCE to evaporate and escape.

These suggestions apply if the contaminated water has volatile chemicals such as TCE, benzene, and chloroform, but not if the chemicals are not volatile such as the metals lead, chromium, or arsenic.

Dr. Beverly Paigen is a retired cancer research scientist living in Bar Harbor, ME.

Drinking Water Filters

Is your water contaminated? Are you worried about chemicals in your water? Are you upset by stories in the news about your nearby, leaking landfill? Are there stories about local gas stations with leaking underground storage tanks?

Groundwater contamination is a serious threat to drinking water, especially in rural areas. Some of you may be thinking that a water filter system may be a good way to protect your family. It has become a billion dollar a year industry.

But with this growth comes a wave of trouble: inferior products, over-blown advertising claims and lack of information about filters' limitations and the importance of maintenance requirements. Unscrupulous salespeople prey on fears generated by news stories about toxic spills and leaks. In California, complaints about water filters are second only to travel complaints, according to the Attorney General's Office. Thus, California created a law that took effect in Spring, 1988 which requires all water filters to pass a test certifying their performance before they can be sold in the state. But if you don't live in California, there's no good way to know what works, what's important and what's hype.

But let's take a more basic look at water filters. Do they really protect your family? Do they solve contaminated water problems? Most filters can reduce (but not eliminate) some toxic chemicals in your water but they are not the answer to contaminated drinking water. Filters are at best, only a temporary remedy.

What Are the Limitations of Water Filters?

No filter can handle all water quality problems. Most only remove a percentage of contaminants. It's important to match a filter system to the specific contaminants you want to remove. Don't expect the manufacturer to tell you everything you need to know about what the filter will (or won't) do. You should probably have your water tested first, so that you know what contaminants are there and can pick the right filter for the job you want done.

The greatest single limitation of all filters is knowing when to change it. To change the filter core at the right time, you first need to know how contaminated your water is and then, you have to know how much water you're using (i.e. how much water is channeled through the filter). The more chemicals present and the more water used, the quicker the filter needs to be replaced. While you can monitor water use, the only way to monitor contaminant levels is to test the water. Not only is this time-consuming and costly, it's also impractical.

Another deficiency in water filters is consistency. A filter is most efficient when new. But with use, filters collect more material and eventually clog. Then contaminants pass through.

Cost is another problem. Though some filters are cheap (both in price and in quality), a system can run from $30-800. Add to this the cost of filter replacement. Some manufacturers suggest you replace filters every four to six months, but this is based on "typical" water usage which may not be right for your situation. More importantly, the manufacturers do not know the level of contaminants present in the water. You may need more frequent replacement.

In What Situations Would A Water Filter Help?

Despite their limitations, filters can serve a purpose. Their most practical use is as a temporary measure while the source contamination is being cleaned up. No matter how well organized your community is in fighting for a cleanup, it takes time to clean up a contaminated site.

Traditionally, water filters were designed to eliminate odor and taste problems and they are effective in this. They can also provide an extra measure of safety

when used on systems that are already treated, such as municipal water systems.

Are There Any Certifications of Evaluation Program for Water Filters?

No. Aside from truth-in-advertising laws, manufacturers aren't subject to any rules and regulations, aside from California's law. Each advertising claim needs to be carefully evaluated against your own circumstances before you can decide whether a filter will work for you.

In conclusion, water filters are at best only a temporary and less-than-perfect remedy. Don't let a filter give you a false sense of security, or divert your energy from fighting for a real solution. You'll need a water filter forever, so long as the source of the contamination is left unstopped. The real answer to water contamination is an organized community that's fighting for cleanup, not some expensive, fancy gadget attached to your water line.

A more detailed discussion and evaluation of water filters is available from CHEJ.

Chapter 7

Interpreting Health Risks

Health Effects from Toxic Chemicals – Fact or Fiction?

Much of what you read or hear about the health effects of toxic chemicals would lead you to believe that chemicals don't adversely effect health, that people have no more worries, or risk, from living near a toxic contamination problem than they do smoking cigarettes, eat a peanut butter sandwich or living in an urban area. Government and industry further argue that it has never been proven that the health of the people at Love Canal was damaged by the chemicals leaking from the landfill, that the dangers of dioxin are overstated and that people become "hysterical" just because they are being exposed to toxic chemicals.

No question people are upset. But they're not upset because they can't understand complicated risk assessments or detailed toxicity information. They are upset because government and industry trivialize their concerns, because they can't get good information on the toxicity of chemicals and no one will give them an honest answer about potential health effects caused by exposure to toxic chemicals.

There is no question that toxic chemicals can cause adverse health effects. This is a fact. But for nearly all chemicals there is not enough information on what happens to people when they are exposed while eating contaminated food, drinking polluted water, having chemicals on their skin or breathing smoke and gases in the air. A 2008 Senate hearing on toxic chemical policies stated that we had good information on fewer than 10% of over 83,000 chemicals in use today.

While most of the information on toxicity of chemicals comes from animal studies, the workers who manufacture the toxic chemicals often are the real guinea pigs. From their experience, we found out that dusty air causes lung cancer, benzene causes leukemia, radioactive paint causes bone cancer, vinyl chloride, liver cancer, and certain pesticides cause muscle weakness and paralysis.

In the community, an association between health problems and exposure has been almost impossible to "prove", but still many examples exist, especially among children who were found to be highly susceptible to toxic chemicals. At Love Canal, children who were born and

raised next to the canal had reduced growth and slower maturation; in Tucson, AZ, children whose parents drank water contaminated with trichloroethylene (TCE) were born with 2-1/2 times more heart defects than normal; in Santa Clara County, CA, state health researchers found an "unequivocal excess" of miscarriages and birth defects in a San Jose neighborhood where trichloroethane (TCA) and other toxic chemicals contaminated with TCE and other chemicals were born with leukemia; in Hardemann County, TN, residents exposed to carbon tetrachloride and other contaminants were found to have a higher incidence of eye damage than normal; in Lowell, MA, private researchers found an increase incidence of several "sub-clinical" health problems such as heart problems, persistent cold fatigue, coughing and wheezing in a community adjacent to an abandoned recycling plant where thousands of leaking barrels were stored in abandoned buildings.

Despite the fact that adverse health effects have been documented in animals studies, from occupational exposures and in the community setting, scientists still find in it extremely difficult to tell exactly what health effects will occur following exposure to toxic chemicals.

Let's look at some of the reasons why. First, there are a number of factors that determine what happens when a person is exposed to chemicals, including how an individual body responds to exposure (this varies quite a lot from person to person), how long exposures occur, how many chemicals you're exposed to and their toxicity. Without knowing all these variables, it's very difficult to predict what will happen when a person is exposed becasue, in most instances, most of these factors are unknown.

A second factor is that many symptoms or diseases are not specific to a particular chemical. In most instances, there can be many causes of the symptoms that people are having. And since few physicians have any experience with exposures to toxic chemicals, they often tend to blame the victim for his or her situation rather than looking at chemicals as a possible explanation. For example, many physicians will diagnose a person who is fatigued, moody and without appetite as "depressed", likely to have a problem at home or at work. Seldom is exposure to toxic chemicals considered, even if it's raised by the patient. Usually every other possible alternative is considered first.

Another problem in evaluating health effects is determining what the "normal" rate of illness or disease is in a community. Scientists simply can't decide amongst themselves what is normal, in large part because of the many uncertainties we've already discussed.

As a result, evaluation of chemical exposures is largely a matter of opinion, not fact. Scientists can give you their "best guess" of what they think will happen, but no more. They can only give you their opinion, but an opinion none the less.

So what do you do in this situation?

How do you decide what steps should be taken to protect people's health? Government and industry would suggest scientific meetings to develop standards that define "accetable" levels of exposure. Don't let this happen! Get involved and take control or, at least, have influence over the process. When you're not sure or clear just what the health risks are, decisions should be made that protect people's health first and worry about what we don't know later.

But such decisions won't happen without your influence and insistence. Industry will argue that another factor must be brought in: cost. They claim that, in the absence of proof of health damages ("no one has ever died from living next to a dumpsite"), they should be allowed to continue to pollute until we know the health effect for sure. Government will give in to this pressure unless we all stand up together and

say no, not any more.

Government and industry criticize people for being "hysterical" or emotional about health effects. They often try to avoid confrontation and controversy by making it difficult for you to get information. They simply don't trust that people will understand. But ask yourself, are you more upset when you know something is wrong but don't know what it is or when you find out what it is? And worse yet, does anyone else have the right to decide for you? I don't think so.

In summary, yes, toxic chemicals can and do cause adverse health problems and yes, many uncertainties and few facts exist about low level exposure to mixtures of chemicals. But you do have the right to know what health effects are associated with and caused by exposure to toxic chemicals. Once you have that information, you may not be fully satisfied, but at least you've got a good sense of what's known and what's not. Then you can decide for yourself what action you need to take. Call us if you want some help.

Health Surveys: Think Before You Count

Spring is here: birds are chirping, flowers are blooming, and temperatures are rising. But, in areas contaminated with toxic wastes there are other obvious signs of spring. The air begins to smell, chemically-colored water begins to run into the streams, creeps, rivers and ditches, and your family begins to again have respiratory, skin, and other health problems.

During the cold weather months, your group had gone into hibernation. Now, with warmer weather and the return of the problems, you want to reactive your group and they, in turn, want to get moving again. But the question is "What should we do?" More often than not, the answer is: "Let's do a health survey."

Many grassroots leaders think a health survey is a way to organize, while others think it will prove that a problem exists and thus the "authorities" will have to take actions necessary to protect people. Unfortunately, neither of these two beliefs are true. Believing these myths can backfire on an organization. Before you decide to do such a study, you need to be aware of these myths and know what questions to ask to get at the truth.

First, let's talk about myths:

Myth: If we do a survey, we can use it to organize.

Wrong! You must have an organized group which has gained the trust of the community before you go door-to-door. No one is going to give personal information to a complete stranger.

Although you have talked to many people and think there is a real problem, you are the exception not the rule. People do not always know as much about the situation as you do. They may think you are blowing the situation out of proportion or, worse, not talk to you at all.

Myth: If we conduct a health study, we can prove there is a real problem.

Wrong! For every scientific fact you bring to "their" attention, they will find other "facts" to discredit your findings. For Example:

- Layperson reporting to layperson;
- You're not an epidemiologist, thus it's not scientific study;
- The people who conducted the study are people with a vested interest in the outcome and bring in strong bias;
- The population is sensitized and thus are over reporting their health problems;
- Not enough people were interviewed to make a valid study. You must interview 95% of the population;
- The population is too small to get a statistically significant difference; and
- There is no "control" population for comparison.

Other problems associated with conducting a health study in your community include:

Political Backlash: if you are not sure you really have an increase in disease, you may want to avoid such studies. Too often, communities who thought they had a problem added the numbers only to find they did not - or it was not statistically significant. Then, the government agencies and responsible corporations used that information against them: "You proved yourselves that there's no problem. Why don't you go home and stop scaring people." Or "Since you proved there is no problem, we are putting your site on the bottom of the cleanup priority list."

Effect on Legal Rights: If your study results in people discovering an injury, you've set off the statute of limitations "clock": the time between when an injury is discovered and when you must file a lawsuit to recover damages. In some states, the time allowed between discovering and filing is as short as one year.

Consequently, you may be forced to file a lawsuit before you're ready or if you're not aware of the status, you could have missed the limits and not be able to sure at all.

So how do you decide if you should do a health study? First, define what you want. Ask yourselves: What would be the purpose of a study? What do we want to accomplish? Do we really think there is an increase in disease in our neighborhood? Is the population large enough to show a statistically significant difference? If you've answered these questions and you still want to do a health study, there are several steps you can take to avoid some of the problems mentioned earlier.

Avoid the word "study." It implies scientific validity; since you aren't a scientist, you need to take a different approach: conduct a "community health profile."

Profiles have fewer risks and more advantages. If you find an increase in disease, you can use that information the same way you would've used it if you had done a "study". If you don't find an increase, the information cannot be used against you: you are (at least publicly) "profiling" the community, not attempted to determine if a problem exists.

More people may participate in a profile, including those who think there is no problem. A profile can be sold to the non-believers as a way to gather and maintain health information on the community to be sure health problems (such as cancer) don't arise in the future.

A profile gives you a baseline for comparison in the future. It can also give the community a sense that the organization "really cares about us," because the citizens' group is looking out for the community's health and well-being, while the "authorities" are ignoring the community's concerns.

You also don't need 95% of the community to participate nor do you have to be concerned about the size of your population. In doing a health profile you do not need to have a "control" population. However, if an increased disease incidence is found and you want to use it publicly, then there are ways to use internal controls.

Baffled By the Terms

- Control Group is a comparison group comprising of persons who have not been exposed to the environmental chemicals being studied.
- Epidemiology is the study of factors determining the occurrence of disease in populations and distribution of disease frequency.
- Incidence is the number of cases observed in a specific period of time. For example, if seventeen (17) people report skin rashes in a population of 100 people, the incidence rate is 17/100 or 17%.
- P-Level is the probability that an observation is not real but due to chance instead. For example, a p-value of 0.05 means that there is a 1-in-20 chance that the observation is the result of a chance occurrence, and not an actual real observation.
- Statistical Significance is a statistical test used to evaluate the likelihood that the difference between two study groups is a random effector caused by some causative variable. For example, a study that is not statistically significant at a p-value of 0.05 (see p-value), means that there is a more than 1-in 20 chance that the differences between the two groups was not real but rather a spontaneous occurrence which occurred "by chance" and therefore, there is no difference in the study groups.
- Statistical Power is a statistical test that helps to define the ability (or chances) of a study to detect differences among difference groups, or to uncover an effect, if one really exists. Talking about "power" is a formal way to making the common sense statement that a small study looking for a small difference has a small chance of finding anything. Conversely, a study of low power that did not show a statistically significant effect provides little or no assurance that there is no effect to be found. An observed difference in a small study has to be larger than an observed difference in a large study in order to be labeled statistically significant.

Medical Help for Toxic Problems

By Gary L. Gillen, M.D.

My friends at CHEJ asked me if I could help them advise people how to get medical help with hazardous waste problems from local physicians. Individuals and groups need help both with personal health problems and with public health concerns. Up to now, doctors have been slow to become involved with local groups. Some doctors have been reluctant to believe that various illnesses might result from exposure to hazardous materials. A few in the public health structure have been downright difficult to deal with even when circumstances suggested that cooperation would be more appropriate.

I think most of you will start to see more local physicians and medical societies becoming interested in hazardous waste problems in the next few years. But my advice is, "Don't wait for it to happen!" Get busy getting your local physicians involved. There is no magic to how to do that; get the information in front of them in a way that gets their attention. That is really the same methods you use to build your group no matter who you are approaching.

Doctors as a group are low to jump on bandwagons. Our training and our daily practice regularly demonstrate to us that the good new ideas are far outnumbered by the bad new ideas. Time will usually show the difference. We tend to stick with the old tried-and-true methods and ideas until the new treatment or procedure has clearly demonstrated their safety and effectiveness. Our conservative streak has saved us from many personal and professional disasters. We have seen new medications taken off the market after a year or two because they caused babies to be born without arms or legs, liver toxicity and sudden allergic reactions resulting in death. (Unfortunately, that same conservative tendency has also resulted in needless deaths, illness and suffering due to delays in accepting the safety of smallpox vaccination, slowness in seeing the value of washing one's hands before surgery, and reluctance to accept the safety of anesthesia during surgery.) We do come by our conservative image honestly and, in general, without apology. Understanding that might help you to understand your own doctor's slowness to see your point of view.

Don't count your doctor out, though. Our own literature is beginning to run articles about the effects of hazardous materials and toxic wastes. Doctors and scientific groups are becoming more aware of what you already know. In the next few years you will find your local doctors more interested in what you are doing. Don't wait for them to come to you, though. Get your information to them now. Ask them to join you in cleaning up your local problem now. Show them summaries of your engineering studies. Not all of them will read them, but many of the ones who do will become very effective allies. Many doctors still do get into medicine with the idea of helping people. Most will come out to help when there is a threat to their local community if they can recognize the threat and believe in it.

If you are going to your doctor with a more personal health problem, be aware of those same conservative tendencies. Your doctor may be slow to recognize that your medical problem might be due to a toxic exposure. We have not been taught to think about such things. Furthermore many of our own resources have been slow to alert us to possibilities of toxic effects to "protect" the public from panic situations. Talk with your doctors about your concerns. Ask their opinion. Tell them the source of your concern. They shouldn't laugh. Even if they don't believe you at first, they may come to a different conclusion after some thought or some attempts at treatment, or if more patients coming in with similar problems. If your doctor won't take your concerns seriously; or if he/she refuses to talk about it, you need to get a new one.

Be patient. Be persistent. Be honest. Don't overlook recruiting your doctor's spouse. You can get medical help for your toxic waste problem.

Dr. Gary Gillen is a private physician located in Circleville, OH.

Quantitative Risk Assessment: The Illusion of Safety

By Robert Ginsburg, Ph.D.

At one time, EPA announced that the agency will conduct all risk assessments at Superfund sites used to select cleanup remedies "that protect human health and the environment." Just like other claims from EPA, this one has lots of hidden consequences. EPA is relying more and more on a particular form of risk assessment called "quantitative Risk Assessment" (QRA). They are using QRA in many new regulations including the Superfund RI/FS Guidance Manual, Hazardous Waste Land Ban regulations and new air toxics regulations. Superfund cleanup projects and efforts to control toxic substances, as well as EPA's support of Pollution Prevention/Toxics Use Reduction are also greatly effected by this decision.

EPA and Industry paint QRA as "good science" that gives "objective" evaluations of contaminated sites. They want people to believe that opposition to QRA-based decisions is due to the public's ignorance of science and technology. The truth is quite different. QRA calculations are very subjective and contain enormous uncertainties. QRA calculations can easily and legitimately vary by a factor of 1,000 depending on what information is used and what assumptions are made. Unfortunately, these weaknesses are never clearly presented or they are ignored altogether, thereby, leaving community groups confused and, often, cut out of critical decision-making.

WHAT IS A RISK ASSESSMENT?

Risk assessments have different meanings to different people. In general, risk assessments provide estimates of health effects cause by exposure to chemicals. Quantitative risk assessment is different and has a very different meaning. QRA is a process that provides a numerical measure of damage to human health from a specific source of pollution or by exposure to identified pollutants. The results are expressed as so many extra cases of cancer when 1 million people are exposed to a certain concentration of a single pollutant.

When EPA and industry discuss "Risk Assessment" they describe the process and content of "Health Risk Assessments" while in reality it is the more limited QRA that is the basis for decisions. This deliberate confusion is set up to give scientific credibility to QRA-based decisions and to avoid discussions as to the validity of QRA in setting standards.

HOW ARE RISK ASSESSMENTS DONE?

There are 4 basic steps to a QRA: (1) Evaluating whether a specific substance or substances increase the incidence of a disease; (2) Estimating the types and amounts of pollutants released; (3) Estimating what concentrations of pollutants may be transported to the point of exposure; and (4) Estimating what extra exposure risk to that concentration might exist (e.g. "one extra case of cancer in a million people exposed").

TECHNICAL LIMITATIONS OF QUANTITATIVE RISK ASSESSMENT:

One of the biggest weaknesses of QRA is that they are almost entirely limited to the risk of cancer based on studies of cancer incidence in lab animals and, occasionally, in workers. This "standardized" approach, looking only at cancer, ignores possible health damage to other organs such as the reproductive, nervous and immune systems and says almost nothing about the likelihood of getting rashes, headaches and dizziness, breathing disorders, allergies, liver and kidney effects, etc. EPA simply assumes that the risk assessment calculation for cancer is sufficient to protect people from all ill health effects. Yet, there is no scientific basis for such conclusions.

Previous research has shown that estimates of cancer effects may not be the most sensitive indicator of risk. Effects on the nervous, reproductive and immune systems may be greater than cancer at the same level

exposure. This concern becomes even greater when considering real world exposure where simultaneous exposure to the same or similar substances often occurs through a number of routes of exposure (such as contamination of food, air and water).

Another major problem with QRA is the large degree of error and uncertainty in how the calculations are made. When a report states that the risk from exposure to pollutants from an incinerator is one-in-one-million, the true risk may range anywhere from one-in-a-hundred to one-in-ten billion. An error range of 10,000! Some sources of this error and uncertainty include:

Emissions Estimates that include errors in monitoring such as using average emissions as opposed to emissions during malfunctions or state-up or emissions from other facilities during trial burns rather than actual operation;

Exposure Estimates that generally use mathematical models to calculate what someone might be exposed to at some specified point such as a fence line or a well. EPA generally uses results from modeling even if they have actual exposure levels because they believe the models more than the sampling;

Health Effects or Risk Estimates that use assumptions to calculate "Risk" (such as whether and how to use inconclusive epidemiology and animal studies) that can vary the results by a factor of 1,000 alone. These assumptions also fail to consider exposures to sensitive populations such as infants, small children, the elderly, or additional exposures from past, current or future pollution. This is perhaps the greatest source of uncertainty in the entire process.

Finally, QRA does not consider the likelihood of the facility's failure. For example, in nuclear power plants, the calculated risk of an accident may be small but it becomes greater the longer the plant runs and increasingly greater when the risk includes operator error. Obviously, the impact of failure at places like Chernobyl and Love Canal were enormous even if the "probability" of failure was small.

WHY HAS EPA/INDUSTRY ADOPTED QUANTITATIVE RISK ASSESSMENT?

Understanding why this approach has been so aggressively promoted by EPA and industry requires an understanding of how EPA perceives its responsibility. First, EPA and industry believe the goal of environmental decision-making is to manage exposures to toxic substances. Citizens have always said the goal should be to prevent exposure. With management of pollutants and polluting facilities as the goal, EPA has looked for methods of controlling sources rather than protecting public health.

Second, EPA is always trying to find ways to incorporate the appearance of "scientific objectivity" into its decisions and QRA fits nicely into this approach. As a result, QRA gives EPA a way to estimate what levels of pollutants are "acceptable" without having to evaluate available technology, alternative processes, alternative substances or community concerns. For example, EPA can set cleanup levels or emission levels by calculating different risk levels and determining (in their infinite wisdom) what exposure level will not result in any "significant risk" at a define "point of exposure."

In reality, this is a sophisticated form of the DILUTION solution. This "acceptable risk" level is by definition an average (determined by models with limited monitoring capabilities) and in almost all cases, there will be some people exposed to higher levels and other cases exposed to lower levels. However, this is quite consistent with the goal of managing and not preventing exposures. EPA can now calculate a minimum level of exposure which is independent of any particular site and which ignores the ability to achieve lower emissions, better clean-ups or even eliminate the use, discharge or exposure to a contaminant.

EPA has also effectively cut out public participation by reducing the risk discussion to a technical calculation which requires technical expertise to do the calculations and to argue over the basic assumptions in the risk assessment. Furthermore, the general public is put on the defensive by seeming to oppose good, "state-of-the-art" science. The public's concerns are trivialized by analogies comparing the risks of drinking contaminated water to hang-gliding, smoking, driving, or other irrelevant and misleading comparisons. Such comparisons confuse voluntary and controllable risks (like smoking, driving, etc.) with involuntary and individually uncontrollable risks (plant emissions, dumps, etc.).

CONSEQUENCES OF USING QUANTITATIVE RISK ASSESSMENT FOR POLLUTION PREVENTION AND TOXICS USE REDUCTION:

QRA is fundamentally incompatible with Pollution Prevention and Toxics Use Reduction. When QRA is used, it applies only to a limited number of substances and justifies setting "allowable discharge levels." Industry can use QRA calculations to avoid changing processes or even adopting reasonably available technology (bans or best technology will not have to be considered possible). The chemical industry, for example, challenged air toxics regulations in Wisconsin using the argument that no limitations on process or emissions of hazardous air pollutants can be required unless a site specific assessment shows a significant risk. If such an argument is even partially successful, Pollution Prevention efforts and Toxics Use Reduction plans can be made toothless.

Robert Ginsburg is a former Treasurer for the United Association for Labor Education.

The Risks of Birth Defects: Living Near Toxic Waste Sites

It took some time, but the New York State Department of Health (DOH) has come around to the high level thinking of the residents of Love Canal. A study published in the American Journal of Epidemiology confirms what Lois Gibbs and others fighting the dangers of the Love Canal and other dump sites were saying long ago: It's dangerous to live near toxic waste sites!

This study, conducted by DOH and researchers at Yale University, found that the closer you live to a contaminated site, the greater the risk is of having a child with a birth defect. This is not just gut instinct or observation of the obvious, this is a rigorous, hard, scientific conclusion that shows a "statistically significant" difference between the rate of birth defects in a control group compared to those living near dump sites.

The researchers found that mothers living less than one mile from a contaminated site had a 12 percent higher risk of giving birth to a child with a birth defect when compared to mothers who lived more than one mile from a site. Rates were highest for defects of the central nervous system (CNS), the musculoskeletal system, and the skin.

If you looked at the sites "with the greatest potential for exposure," the rate of birth defects was 63 percent higher than for non-exposed controls. For CNS defects, the rate was 48 percent higher; for the musculoskeletal system, the rate was 75 percent higher and for the integument system (skin), the rate was 163 percent higher.

The authors looked at the records of more than 27,000 births throughout New York state for the years 1983 and 1984. They categorized the births according to address and the type of birth defect. The data came from the New York State Department of Health Congenital Malformation Registry. There were 9,313 infants studied with birth defects such as cleft lip and cleft palate, chromosomal anomalies and digestive, muscular and nervous system abnormalities. A comparison group of 18,802 normal births was selected from the same registry and matched with the "exposed" group.

The authors then looked at 590 inactive hazardous waste sites in 20 upstate New York counties. These sites were ranked by the state DOH according to their "potential for human exposure to toxic substances" using EPA's hazard ranking system. This system focused mostly on existing evidence of contamination. The communities were further broken into three groups - those with high, medium or low exposure. The high exposure communities were those within one mile of a site where there was documented evidence of contamination.

What's remarkable about this study is that the authors did everything they could to look at the data in ways that would reduce the likelihood that they would find anything. They bent over backwards trying to dismiss the results and tried to show that there was no problem. They eliminated certain types of birth defects; they looked only at defects that were "likely to be associated with waste sites;" and they did not include data on spontaneous abortions and fetal deaths.

The researchers concluded that the study "does suggest a small positive association between proximity to hazardous waste sites and birth defects" but they qualify their conclusion by stating that the study has certain limitations. Their biggest concern was that no one can be sure that the mothers were actually exposed to chemicals from the waste sites and thus the birth defects were the result of exposure to chemicals leaking from these sites.

Does this sound familiar? Once again government is trying to excuse what they found and protect industry by carefully wording what they say. Why is the health department for the state of New York more worried about whether they say anything that would hurt pri-

vate business than they are in protecting the public's health? I think the answer lies in the influence big business has not only on government but also on the politicians who dictate the priorities of government.

Despite these cautions and efforts to minimize the results, the study still found a 12 percent increase in all birth defects for those who lived less than one mile from any dump site and a 63 percent increase for those who lived less than one mile from the worst sites. Had the authors been more lenient in choosing data to include, had they included information on miscarriages and stillbirths and had they not categorized data in ways that leaned towards dismissing the results, the effects would be even more striking.

The positive side of this approach is that the results are stronger, more convincing, and less subject to challenge. No one can say that the authors were biased or that they used inappropriate methods to get a positive finding. This also means that the true effects might be even greater. By including some of the data that the author eliminated, the risks would have been even higher.

But no matter what industry or other critics say, they cannot take away the fact that every time a good, solid, study is done to evaluate health problems in a community affected by toxic chemicals, researchers do find health effects. The evidence is growing each day. The heart defects in children born to mothers exposed to trichloroethylene (TCE) in drinking water in Tucson, Arizona; the increased miscarriages and birth defects in San Jose, California; and the leukemic children born in Woburn, Massachusetts, are just a few of the health problems found in communities near contaminated sites.

These problems are real. Exposure to toxic chemicals does cause adverse health effects. We have to stop listening to industry and government who tell us these problems are not real and who negate the evidence that chemicals cause health effects. Their agenda is to stall for time and to avoid accountability for their actions.

The truth is the more we look, the more we find. If we wait until we are absolutely sure that chemical X caused health problem Y, then it surely will be too late. We cannot afford to wait until the bodies are in the street. We need to act now, to hold industry accountable for the pollution they create and to make government more responsive to the needs of the people.

Resources

- "Risk of Congenital Malformations Associated with Proximity to Hazardous Waste Sites," Sandra Geschwind, Jan Stolwijk, Michael Bracken, Ed Fitzgerald, Alice Stark, Carolyn Olsen and James Melius, American Journal of Epidemiology, Vol. 135, No. 11, pp. 1197-1207, August 1992.
- "Public Health Aspects of Toxic Chemical Disposal Sites," Arthur Upton, Ted Kneip and Paolo Toniolo, Annual Review of Public Health, Vol. 10, pp. 1-25, 1989.
- "Health Effects from Toxic Chemicals—Factor Fiction," Stephen Lester, Everyone's Backyard, Vol. 6, No. 2, Summer 1988.

These reports are available from CHEJ.

Mothers, Throw Away Your Peanut Butter!

At least that's what Dr. Bruce Ames would have you do. Once well-respected among many in the cancer prevention and environmental field, Ames became toxic polluters' favorite scientist. Ames argued that naturally occurring carcinogens were more dangerous than man-made substances, and that people's efforts are misdirected when they try to avoid the dangers of most toxic chemicals.

It's true there are natural carcinogens in peanut butter, mushrooms and several over vegetables - but this does not relieve industry or government from its responsibility to control chemical hazards and pollution. Ames and his arguments are being used to distract people away from the real issues of safeguarding our health.

People have a right to choose their risks. They can choose whether or not to smoke cigarettes or eat peanut butter, but they cannot choose not to breathe air. Industry must be held accountable for the waste it generates and the pollution it creates in our air, water, land and food.

Who is Bruce Ames?

Bruce Ames was a research scientist at the University of California at Berkeley. He made a name for himself in the mid-1970s when he developed the "Ames Test," a simple bacterial test that measures the ability of chemicals to cause genetic mutations. Since genetic mutants are generally believed to be an important factor in causing cancer, the Ames test was heralded as an important tool in detecting carcinogens - cancer-causing chemicals.

When Ames first introduced his test, more than 85 percent of the selected chemicals that tested "positive" on his test were considered carcinogenic, based on animal tests and studies on workers. Because of this high correlation - and because Ames' test was inexpensive - it quickly caught on, winning Ames both praise and notoriety. His high profile was further established when his test became the basis for banning "TRIS," the fire-retardant chemical that was, at the time, commonly used in children's clothing.

Then circumstances changed. As a wide range of chemicals were tested, the accuracy of his test declined to 60-70 percent. In addition, some chemicals that tested "negative" by the Ames method (such as DDT, chloroform, estrogens and heavy metals such as cadmium) were found to be carcinogenic when other testing methods were used.

At the same time that these doubts were raised about the value of the Ames test, Ames became friends with ultra conservative political economists, advocates of the free market "supply-side" philosophy that was the dominant economic – and political – theory in the Reagan Administration.

By the early 1980s, Ames had totally reversed himself on many of his key positions. He supported his flip-flop by developing the "HERP Index" (Human Exposure dose/Rodent Potency dose), a highly misleading method for evaluating the carcinogenic potency of a chemical. Using this method, Ames argues that a daily glass of wine is as dangerous as the "average occupational exposure to formaldehyde," that peanut butter is as potent a cause of cancer as exposure to toxic industrial chemicals, and that eating mushrooms, brown mustard or bacon is more dangerous than our daily intake of PCB's, DDT or ethylene dibromide in our food.

The new Bruce Ames and his potency index were challenged and exposed for presenting a deliberately distorted picture of cancer risk (see references). For example, his renewed position on the cancer risk of wine leaves out an important fact: alcohol is not a cancer-causing substance in and of itself. Instead, it is considered a "promoter," enhancing the effects of other chemicals. It's also an irritant, making the body more susceptible to damage caused by chemical

exposure.
For example, throat cancer is often found in heavy drinkers who are also heavy smokers. Throat cancer develops not because alcohol itself is a carcinogen, but because it is an irritant, causing drinkers who also smoke to get cancer. Liver cancer isn't "caused" by alcohol, but the liver damage caused by heavy drinking makes that organ more susceptible to the chemicals that do cause liver cancer.

Peanut butter, Ames' other favorite scapegoat, does contain a potent carcinogen, aflatoxin, produced by a mold that grows on peanuts and grains. Aflatoxin has been linked to high liver cancer rates in Africa, but in the U.S., liver cancer is rare, even though there are significant amounts of aflatoxin in our peanut butter supply. Why? The likely cause for the difference in liver cancer rates is the high incidence of hepatitis is Africa. In the United States, individuals who have hepatitis also have a high incidence of liver cancer. Most likely, it's the combination of the hepatitis virus and the aflatoxin, acting together, that causes the cancer.

Why has Ames changed his positions from fighting chemical such as TRIS to attacking peanut butter? There has been no major change in our understanding of how or why cancer occurs in the past decade. There have been many advances, especially in our understanding of the way cancer develops, but these new findings are consistent with earlier views that cancer can result from damage to the genetic portion of cells (DNA).

What has changed in the last two decades is Ames' political views.

Here's one theory: Ames, who always had a reputation for having a big ego, finds his testing methods slipping in prestige. Around the same time, he is befriended by political ideologues who introduce him to a new way of looking at the world. He develops a "new" method for ranking carcinogenic risks. As his research and public pronouncements take a new slant, focusing on "natural" carcinogens, industry starts to give him the rewards and homage he was missing form his peers and the public. The Reagan Administration adds fuel to this change by abruptly shifting federal policies and research funding away from industry-generated hazards towards lifestyle and blame-the victim theories of cancer causation.

Industry's interest in using the new Bruce Ames is transparent. It's great for them to have a big-name scientist talking as if he's one of them. His line is very useful to industry: don't worry about synthetic toxics-the real problem is in your broccoli. The best way to deal with industry or government officials who cite the wisdom of Bruce Ames is to recognize it for what it is: an illogical and highly biased distraction from the real health issues.

Our advice is to dismiss Ames and his arguments that pretend to be scientific. Stay focused on the real issues. Cleaning up chemical contamination is what's important. Avoiding and eliminating preventable exposures that result from industrial disposal and pollution is what's important. Hold onto your peanut butter sandwich, and go after the polluters.

Additional Reading:

•"Leading Scientist Laughs At DDT, Worries About Peanut Butter, Believe It Or Not," David Bollier, Public Citizen, September/October, 1988
•"Patheolithic Diet, Evolution and Carcinogens," Letter to the Editor, Devra Lee Davis, National Research Council, National Academy of Sciences, Science, December 18, 1987, pp. 1633-34
•"Carcinogenic Risk Estimation," Technical Comment, Samuel S. Epstein and Joel B. Swartz with 15 co-signers, Science, May 20, 1988, pp. 1043-45.
•"Perspectives on Comparing Risks of Environmental Carcinogens," Frederica Perera and Palo Boffetta, Review, Journal of the National Cancer Institute, Vol. 80, No. 16, October 19, 1988, pp. 1282-1293.

Baffled by Bruce

Bruce Ames has not always had the same scientific views on the dangers of chemicals that cause cancer. Here are some of the differences that we have identified between Bruce now and Bruce then.

Bruce Then

In 1977, Ames warned that the pesticide ethylene dibromide (EDB) is a potent carcinogen whose structural similarity to Tris is one of the reasons why EDB "should not be used." In 1977, Ames demanded urgent steps to "minimize human exposure to (synthetic) chemicals," pointing to "enormous possible (carcinogenic) risks" from inadequately tested industrial chemicals and predicted that a "steep increase in the human cancer rates from these suspect…chemicals may occur…as the 20-30 year lag time of chemical carcinogenesis in human is almost over." In 1977, Ames emphasized the need for high-dose testing in an effort to compensate for the "inherent statistical limitation in animal cancer tests" and expressed concern about "the effects of the large-scale human exposure to the halogenated carcinogens [including] vinyl chloride, strobane-toxaphene, aldrin-dieldrin, DDT, trichloroethylene and heptachlor-chlordane." Ames urged the need to establish "priorities for trying to minimize human exposure to these synthetic chemicals."

In 1977, Ames showed that cancer dose-response curves usually rose less steeply than linear curves and criticized the view that many carcinogens have activity only at very high doses.

Bruce Now

In 1986, Ames argues that before EDB was banned, it was present in "trivial" amounts in food and that "the average daily intake was about 1/10 the possible carcinogenic hazard of aflatoxin in the average peanut butter sandwich, a trivial risk itself." In 1983, Ames claims cancer rates are not rising, that synthetic carcinogens pose only trivial risks and that the real culprits are "natural carcinogens, faulty lifestyles, tobacco and high-fat diets." Ames later (1987) further revised his thoughts on the role of high-fat diets as merely "a possible risk factor in colon cancer."

In 1987, Ames challenges the validity of using animal tests to estimate human carcinogenic risks, claiming "there is little sound scientific basis for this type of extrapolation." Ames calls for the "need for more balance in animal cancer testing to emphasize…natural carcinogens as well as synthetic chemicals." In 1987, Ames maintains that cancer dose-response curves rise more steeply than linear curves and that tumor incidence increases more rapidly than proportional to dose.

Chapter 8

Politics

Why EPA is Like it is

By William Sanjour

I am frequently asked why the United States Environmental Protection Agency does not seem to be particularly interested in protecting the environment. EPA is frequently cited as not only failing to protect the environment but even for working at cross purposes to environmental protection. I've concluded that to understand why EPA is the way that it is, you must start at the top, at the White House.

Any President of the United States and his immediate staff have an agenda of about a half dozen issues that they are most concerned with. These are usually national security, foreign affairs, the economy, the budget, and maybe one or two other issues. These I'll call the Class A priorities. Other presidential responsibilities such as housing, education, welfare, transportation, the environment, veteran's affairs, etc. I'll call Class B priorities.

Equally important, but less well-known is the so-called "hidden agenda." This includes such considerations as getting re-elected, getting supporters re-elected, and "where do we go when our term in office is over?" The hidden agenda is not peculiar to the White House as similar considerations are shared by every government official from the Speaker of the House to the House janitor. We are, after all, talking about people who, although they may be lofty government dignitaries, nevertheless have mortgages to pay, children to send to college, and orthodontist bills. When one brings the hidden agenda out of hiding, the actions of the government become the actions of people and they become clearer.

For the Class A priorities the President appoints people he knows and trusts and he demands performance. He will expect the military to be able to deploy forces anywhere in the world when an emergency arises. If they are not ready when he needs them, he will "bang heads and kick asses." But can you picture any President of the United States bringing the Secretary of Education into his office and slamming his fist on the table because of low SAT scores in Sheboygan? Or bringing the Administrator of the Environmental Protection Agency into the oval office to chew him out for the pollution in the Cuyahoga River? I can't. And that, to my mind, is the difference. The President expects performance in Class A. He expects something else in Class B.

That something else is peace and quiet. The President will usually appoint people to head Class B agencies who are amenable to the special interests concerned with that agency, rather than his own cronies, but the message that goes out from the White House to the managers in Class B is, "do anything you want so long as it doesn't impinge on the President's Class A priorities." But EPA can do almost nothing which doesn't adversely affect business, especially big and influential business, and that disturbs the President's peace and quiet. Furthermore, uncovering the hidden agenda reveals that the President needs big business to finance election campaigns and his staff is looking ahead to parlaying their White House experience to seven figure jobs in private industry.

The Administrator of EPA is usually someone who is agreeable to the mainline environmentalists but one who is also a "team player." He can make all the speeches he wants about cutting down Brazilian forests and the environmental ethic, but he must not do anything to make waves. This message permeates the entire agency. The message isn't transmitted through written or even oral instructions. It's more a case of survival of the "fittest." People who like to get things done, people who need to see concrete results for their efforts, don't last long at EPA. When it comes to drafting and implementing rules for environmental protection, getting results means making enemies of powerful and influential people. No, they don't usually get fired, but they don't get advanced either, and their responsibilities are transferred to other people and they usually leave the agency in disgust. The kind of people who get ahead are those clever wimps who can be terribly busy while they procrastinate, obfuscate, and come up with superficially plausible reasons for not accomplishing anything.

It is sad and funny to attend Congressional oversight hearings and listen to environmentalists enumerate EPA's inefficiency, incompetence, and intransigence while recommending that its budget be increased. One could point out that EPA has written many regulations, that they have in fact reduced pollution in many areas, they have cleaned up many Superfund sites, and millions of dollars in fines have been collected against polluters and some have even been sent to jail. How does this square with my description of the agency. Easy. In most cases of meaningful action taken by EPA, if you look carefully, you will find that EPA was forced or coerced into taking action and rarely ever initiated it. For example:

EPA more often than not opposes Congress passing really tough environmental laws.

A whole industry has been created by such organizations as the Environmental Defense Fund to sue EPA to make them do what the law already requires them to do and for which they are already being paid.

Taxpayer's money is used to defend EPA against such suits to protect their right not to do what the taxpayers are paying them to do.

It has gotten so bad that a proposed regulation must be under a court ordered deadline (brought by an environmental group) before it will even be considered for the Administrator's signature.

More time and money is spent figuring out how to remove companies from regulation than is spent to get companies regulated.

Most enforcement cases against influential polluters are started by some combination of environmental organizations, the media, and local citizens. It often takes years of badgering through the media and through Congressmen and other politicians before EPA will act.

Although there are occasional newspaper accounts of EPA fining major polluters millions of dollars, when looked at closely, these fines are usually much less than the amount of money the polluter made by breaking the law in the first place.

The point is that anyone who has to deal with EPA (anyone whose property, health and life may depend on EPA) has to know what the agency's real priorities are and act accordingly. It is foolish to assume that "the government won't let them do anything bad to me." After all, EPA is really an un-integrated collection of different offices, each with its own legislation, clientele, and priorities. The priorities are influenced by many outside forces. To illustrate this, lets look at my own office, the Office of Solid Waste (OSW) which has the responsibility for the regulation of hazardous waste facilities.

The groups which, today, have the most influence on OSW are, in order of importance, the waste management industry, state governments, powerful waste producing industries, important congressmen, and national environmental groups. The national media is also important and it can be number one or any other number, but only for a short period of time.

The waste management industry has the most to gain or lose by the activities of OSW. Therefore they expend the most to influence the agency. Unlike the press or grassroots groups, which interact with EPA only sporadically, the waste management industry is in contact with EPA at all levels, at all times. And it doesn't stop with EPA. They are in touch with the President, the White House staff, Senators, Congressmen, Governors, State Legislators, State Environmental Protection Agencies, County Commissioners, the Press, and National Environmental Organizations. Waste management has been the growth industry of the eighties and nineties. The industry has grown very rich through its ability to control the governments who are supposed to be controlling them and it shares its wealth with its benefactors. Bureaucrats learn that crossing the industry can get one into a lot of trouble, whereas cooperating with them has many rewards including the hope of lucrative employment. Scores of federal and state employees have already done so including several former administrators of EPA.

Does this mean that EPA has cynically abandoned the environment for the sake of this powerful hazardous waste lobby? No, just the opposite. Most people in EPA equate the waste management industry with the protection of the environment, and the industry's opponents as anti-environmental NIMBYs. EPA finds it very comfortable to be allied with a big powerful industry which presents itself as the protector and defender of the environment.

The trouble is that the commercial hazardous waste business is a business. As a business, its income is produced by taking in waste through the gate. Waste is money, the more the better. Expense is incurred by treating the waste so as to protect human health and the environment. This costs money. A successful business maximizes income and does everything it can to reduce expenses. These goals are just the opposite of what the goals of EPA should be, i.e. to reduce the amount of hazardous waste and maximize protection of human health and the environment. This business, by its very nature, must do everything it can to thwart serious attempts to reduce the amount of hazardous waste produced in America and at the same time take any shortcuts it can get away with in the treatment of that waste.

There is also a big difference in how the waste management industry and the environmentalists go about their business. The national environmental groups tend to deal with EPA as an institution. Industry lobbyists and technical staff seek out the person responsible for making a decision whose outcome they are interested in and work directly with him and his supervisor. Flattery and ego building are common, powerful tools. In addition to the real and hinted at job opportunities, people who cooperate with the lobbyists find that the lobbyist will lobby for their advancement with upper management. Those who don't cooperate will find the lobbyists lobbying for their heads. The operating principle at EPA is that "no good deed goes unpunished."

The bottom line is that if you want EPA to pay attention to you, you have to affect the careers of EPA

employees. If you organize and have a large block of supporters, then you can influence local, state and federal elections. You can also use your influence on local banks, merchants, or anyone else who might be tempted to profit from a hazardous waste facility in your backyard. By pressuring these people, you in turn affect the pocketbooks and careers of EPA employees, and thus their actions. If you win locally, EPA will follow.

William Sanjour is a retired EPA Employee. For a more in depth paper on why EPA is like it is, contact CHEJ.

Love Canal is "Habitable" But Not Safe

In September 1988, the New York State Department of Health (DOH) celebrated the 10th anniversary of Love Canal by announcing that two-thirds of the area was not "livable." DOH had failed in its earlier attempt to declare the area "safe," and it knew that there was still no way it could get away with declaring safe all of Love Canal. So, proving that even governments can learn from their mistakes, DOH now said some of Love Canal is "Habitable" - admitting some of it is not. But "habitable" does not mean safe, and DOH has been very careful to correct anyone who uses the word "safe" when referring to Love Canal.

Careful examination of the basis for this decision shows the methods DOH used to arrive at this declaration were based more on politics than on good science. Five years of study, $14 million in taxpayers' money and many volumes of experts' reports were DOH's way of giving the appearance that an objective credible scientific approach had been used. But the years, dollars and reports cannot cancel out the political manipulation of the data that influenced all the other decisions and actions.

DOH's approach was simple: select seven "indicator" chemicals; measure them in air and soil in seven designated areas around the canal; and then compare the results to other communities in Niagara Falls and in nearby Cheektowaga and Tonawanda (both located outside of Niagara Falls). While taken at face value this seems a reasonable approach, unfortunately, it's not what DOH actually did.

For each of the seven designated areas, DOH determined a statistical average exposure level, the median (the median is the number in the middle of a series of numbers - there are as many numbers above it as below it. If you have the series 99, 98, 97, 5, 4, 3, 2, the median is 5). This median was then compared to the median contamination level in the four comparison areas. This means that "hotspots" - very high levels of contamination - within each of the designated areas could be well above this average (just as 99, 98 and 97 are well above 5 in the example above).

They selected four comparison locations that were each at least one-half mile from a toxic dump site. They started by looking for areas at least one mile from a dump but gave up because they could not find any such places in the greater Niagara Falls area. Again the median contamination level was determined for each of these four locations.

DOH made decisions about habitability by comparing the median exposure levels in the Love Canal areas to the comparison areas. When they did this, DOH found levels in one of the Love Canal areas to be significantly higher than in all four comparison areas. But for all the other Love Canal areas, levels were consistently higher than the two comparison areas located outside Niagara Falls but similar to the two locations in Niagara Falls. So what did DOH do? They decided to ignore the data from the two locations outside of Niagara Falls and only use data from the two areas in Niagara Falls.

By throwing out the data they did not like and keeping the data they did, DOH made sure that some of the Love Canal area would be determined to be "habitable." They also undermined most of the scientific work that it had painstakingly taken five years to achieve. By using only those comparison areas that met their needs they completely dismissed the fact that levels in parts of Love Canal were statistically higher than two of the four comparison groups.

DOH violated their own criteria for determining habitability set up by their highly visible "Technical Review Committee (TRC)." According to a five-volume report released by EPA (a member of the Love Canal TRC), an area is considered habitable only if indicator values "are not statistically different than the values from the comparison areas." The criteria do not state a place is livable if there are no differences in two out of four comparison areas. DOH did what they

wanted to do despite the criteria set by the TRC. So much for "credible" science.

DOH's approach has other limitations:

House-by-house contamination levels were not considered. Individual locations may contain contaminant levels that exceed "acceptable" levels.

Use of indicators chemicals fails to provide a complete assessment of risks—because only a select number of chemicals are evaluated.

The chemicals dumped in the Canal are still there and thus the potential for further contamination remains.

The results of this study could affect community groups across the country, especially if and when Love Canal is used as the standard that other sites are measured against. The levels considered "habitable" at Love Canal will become standards to evaluate other sites—a serious mistake, because the decisions at Love Canal were not based on a credible scientific approach, but rather on a politically twisted use of data. This report should be shot down for what it is – politics, not science—and its results ignored.

For Lois Gibbs and the many residents who fought so hard to be relocated from Love Canal, the data from this study proves that they were right and that the "experts" were wrong. Housewives with little more than their gut instincts knew their homes were contaminated. The "experts" charged that they were hysterical and irresponsible, that they didn't know what they were talking about. Now the truth is known. Now it's quite clear who did and who did not know what they were talking about.

Further reading:

•"Love Canal Emergency Declaration Area Proposed Habitability Criteria." CDC and DOH, December, 1986.
•"Love Canal Emergency Declaration Area: Decision on Habitability," September, 1988. "Love Canal EDA Habitability" "Fact Sheet" and "Questions and Answers," September, 1988.
•Love Canal Emergency Declaration Area Habitability Study Final Report, Volumes 1-5, Technical Review Committee, USEPA, February – July 1988.
•"Supplement to the Love Canal Emergency Declaration Area Proposed Habitability Criteria," Appendix 6, NY State Department of Environmental Conservation, September, 1988.

All of these reports are available from CHEJ.

Lead Poisoning: The Politics of Lead

A number of years ago, a paper published in the New England Journal of Medicine shook the toxics world. Dr. Herbert Needleman, of the University of Pittsburgh School of Medicine, found that exposure to lead caused permanent brain damage. Dr. Needleman found that children exposed to low levels of lead will likely have learning disabilities and behavioral problems throughout their lives. This study was an 11-year follow-up to a study published in 1979 that first flagged the health damage caused by exposure to low levels of lead.

In another landmark study in 1987, Dr. Needleman showed that a pregnant woman exposed to even small amounts of lead can pass the metal to her baby causing the child to develop serious deficiencies in mental performance during the first few years of life. This was the first time anyone had shown that a child's performance would be affected by lead absorbed while in the womb.

In both studies, the blood lead levels of the affected children were below the "safe" limit set by Centers for Disease Control (CDC). These children showed no other signs or symptoms of lead poisoning.

Dr. Needleman's work has been a significant part of the scientific basis for many public health and regulatory efforts to control lead exposure including removing lead from gasoline (1980-1986): lowering the CDC levels that define lead poisoning, first in 1985 and again in 1991 (the current standard is 10 micrograms per deciliter [ug/dl] in blood); setting the workplace standard; establishing the 1991 Public Health Service (PHS) Strategic Plan to Eliminate Childhood Lead Poisoning; and inspiring recent Congressional legislation aimed at reducing lead emissions into the environment and providing more funds for cleanup, screening, and therapy.

Other studies have confirmed and supported Needleman's research to the point that the Alliance to End Childhood Lead Poisoning calls the evidence of lead's adverse human health effects "overwhelming and indisputable".

Needleman's work has also helped expand the focus of the public's understanding of who is affected by lead poisoning. When CDC lowered the "safe" blood lead level to 10 ug/dl, it estimated that 3 to 4 million children have toxic levels of lead in their blood. According to Needleman, "being white or well off does not shield a child; but being poor and black radically increases the risk. Over 50% of black children in poverty enter the first grade with blood lead levels considered neurotoxic."

These efforts have been successful in raising public awareness of the dangers of lead poisoning despite strong industry efforts to distract people and confuse the issues. A recent report released by the Alliance carefully documents what it describes as a "shrewdly orchestrated public relations campaign to attack and camouflage the scientific evidence of lead poisoning."

Going back as early as the 1920s, the lead industry apparently knew the dangers of lead poisoning, yet succeeded in blocking passage of federal legislation to limit lead in paint for 50 years. According to the Alliance report, the lead industry accomplished this by controlling and disseminating "unfavorable health information to the public..."

From the start, the lead industry used medical investigators who were supported by industrial research grants or who were directly recruited into the industry community. For a long time, there was only one research game in town—the one supported by the lead industry. Its focus was on how a good diet could avoid lead poisoning.

The lead industry also helped foster misconceptions about lead poisoning such as: it was largely a problem of poor inner city black children; the problem was too big to handle; and society simply could not afford the cleanup costs. The frustrations of having to deal with

an overwhelming problem made it easier to justify doing nothing or to "blame the victim" and point to a mother's inferior health care or nutrition, or a lack of attention to the child as the cause of his/her learning difficulties.

The lead industry has also argued that natural occurrences have released more lead into the environment than human-made sources. One spokesperson was quoted as saying, "Lead was on earth before people were, so a certain tolerance for lead must exist in the human body." The industry repeatedly claimed that there had been no conclusive evidence pointing to the "harmful" effects of lead from low-level exposures. But Needleman's and other recent studies demonstrate that this is no longer the case. It is clear that even low-level exposures of lead will cause health problems.

The industry response to these findings was to lash out at Needleman to try and discredit him and his research. Researchers with close ties to the lead industry called for a "scientific inquiry" into Needleman's landmark studies, which were investigated by the University of Pittsburgh at the request of the Office of Scientific Investigations of the National Institutes of Health.

The Lead Alliance called Dr. Needleman the latest target of the lead industry's attempts at "scientific assassination," adding that the industry has a "long history of dirty tricks and dirty science." It described industry's efforts as an attempt to "distract attention from the vast body of scientific evidence by personalizing the issue through attacks on Needleman's 1979 study which has already been sustained after intensive review by federal agencies, objective experts and scientific peer review."

Lead is a serious public health problem. It gets into the environment from many sources. Lead in paint remains the number one source of lead poisoning in children. But lead from gasoline finds its way into soil and onto crops and thereby into the food chain. Lead in water can come from pipes and distribution systems. Lead in food can come from contact with "leaded" dust during processing and packaging and by leaching from seams of lead soldered cans. Even house dust can be a significant contributor to blood-lead levels in many urban areas.

The most overlooked source of lead exposure is contaminated sites created by industrial operations and waste disposal practices. Communities such as Kellogg, Idaho; Butte, Montana and Leeds, Alabama have severe lead contamination due to emissions from metals melting operations. More than 21 square miles in Kellogg are contaminated with lead and other heavy metals. It's the second largest Superfund site in the country.

Communities such as Throop, Pennsylvania and Troy, Ohio have been contaminated by battery "recycling" operations where battery casings were burned in open pits to recover copper. Other communities are contaminated by lead found in wastewater sludge that is being "composted" or spread on farmlands, in toxic waste sites and in every landfill and incinerator built in this country. One survey by EPA ranked lead as the second most common chemical found at toxic waste sites.

The attack on Needleman and other scientists researching the health effects of lead is certainly disturbing, but it highlights how desperate the industry must be. It must feel very threatened by the combined efforts of grassroots community groups, the scientific and medical community and legislative and government agencies that have targeted and acted on the dangers of lead.

The medical and scientific evidence on the health problems caused by lead exposures is overwhelming. Industry efforts to confuse and distract the public have been exposed and have failed. People are increasingly outraged by the government's lack of action and are demanding the resources to clean up the problems and get the lead out.

Community based groups in inner cities, suburban communities and rural farm areas are fast becoming aware of the dangers of lead and are demanding action. People are coming together, sharing resources and information and saying "Get the Lead Out Now!" By joining forces, we can build a powerful base to pressure the decision makers to do the right thing. Together we can be successful.

For more information on the attack on Dr. Herbert Needleman and on the lead industry efforts to cover the dangers of lead poisoning contact CHEJ.

The Dangers of Lead Poisoning

More is known about lead's adverse human health effects than any other environmental toxic chemicals.

Unlike many environmental health risks, the hazards of lead are not based on theoretical assumptions, extrapolations from animals to humans, or conversions from very high doses to low exposures. The irresponsible dispersion of lead in our environment has tragically produced an unparalleled laboratory of human exposures and damage.

Hundreds of studies have documented the impact of higher levels of lead poisoning: coma, convulsions, death, mental retardation, high blood pressure, stroke, and damage to the kidneys and reproductive system.

Scientists in the U.S. and around the world have demonstrated lead's toxicity to fetuses and young children at low doses: reduced IQ, attention deficit disorder, hyperactivity, learning disability, low birth weight and impaired growth.

Source: The Alliance for Healthy Homes (formerly the Allaince to End Childhood Lead Poisoning)

Danger on the Road

By Sybil Peterson

In one 48-hour period, everything that could go wrong in the chemical industry did. Union Carbide's Institute, WV plant leaked a toxic cloud that sent 135 people for medical treatment. A special chemical train explosion in Valentine, AZ sent residents to evacuation centers. A chemical waste truck crashed on the Washington Beltway, stranding 7,000 motorists and forcing 300 families to flee. In Camden, NJ, residents were evacuated when a chemical storage tank ruptured due to careless handling. It's not just dumps that threaten our homes and families.

If you live near railroads tracks or a highway, it's only a matter of time before you're blown up, poisoned or evacuated because of hazardous material that's "just passing through." Some cargoes are hazardous waste, but others are even more lethal, like loads of pure toxic or explosive substances that travel through our communities, noticed only casually, if at all.

These shipments present several problems. For instance, what's in them? The shipper has no records except financial ones. You can find out what's on a freight car from the railroad, but not from labeling on the car because it's often absent or unreadable. Railroad cars leak, making their tracks long, narrow landfills. The National Transportation Safety Board called for the inspection of 3,800 tank cars and found a design flaw in most cars that cause leaks. Leaky cars are most dangerous when they sit in yards set up by many railroads in cities. Some dripping chemicals vaporize; others react with air, form toxic clouds and can cause mass evacuations. Both trains and trucks can be built to resist breaking open on impact. However, this is expensive to do and hasn't been field-tested. In the meantime, there are accidents like the Burlington Northern crash where a train hauling drums of uranium oxide crashed into a truck near Bowden, ND, killing the driver and spilling the contents of 30 radioactive barrels.

Further, half of the trains have brakes that tend to lock, making them tear apart and forcing the cars to derail, the suspected cause of an accident near Pine Bluff, AR. A tanker car exploded, triggering almost 50 derailed cars, some carrying toxic chemicals. Officials waited two days until the fire died down before approaching, while 4,000 people stayed in shelters.

Emergency personnel training is often lacking. Crews don't know what's being transported, so they don't know how to handle it. Most firefighters use water on a blaze, but sometimes that's the worst thing to do. Usually, only large departments may have hazardous materials experts, but many don't. Most firefighters are volunteers with a large turn-over rate, so training is a huge, expensive task. Who should pay? One answer is to charge the companies that generate the chemicals for firefighter training.

Other problems call for better laws and stricter enforcement. Federal law regulates hazardous material transport, packaging and labeling, but states and localities can impose even stronger rules. U.S. law bans trucks with hazardous substances from heavily populated areas or dangerous places (e.g., tunnels) unless there's no practical alternative. This rule isn't enforced, but can and should be. Dallas, Houston, Boston, Portland and New York have routing regulations, curfews or both. Cincinnati fines truckers if they take the interstate through the city, instead of the beltway. Such localities as Prince Georges County, MD, and New Orleans have conducted elaborate mock disaster drills to train emergency personnel.

Industry can contribute to safety, too. Dupont eliminated the need to store and transport MIC (the chemical killer in Bhopal) by redesigning its LaPorte, TX, plant so that, the MIC is processed as soon as it is produced. Closing or blocking regional hazardous waste facilities and promoting on-site recycling and responsible management of toxic waste also cuts down disasters like the crash in Fairfax, VA. Between 1981-3, railroads replaced short-segment, worn tracks with new, almost seamless tracks that are much safer.

Most railroads now have alcohol treatment programs for workers. These came up after the 1982 Livingston, LA crash when 50 cars jumped the track, blew up, spilled 20,000 gallons of chemicals and released a toxic cloud that forced 3,200 people to evacuate. The engineer was too drunk to sit up, so his girlfriend tried to run the train. Despite this tragedy, alcohol will probably remain a chronic problem.

Other issues; railroad highway crossings need better protective devices. Since half of all hazardous truck accidents involve gasoline trucks, they need to be made as crashworthy as possible. So should rail cars. Rules must be better enforced and coordinated perhaps through a single federal agency.

What You Can Do: A Case Study

Chickasaw, AL, residents learned in 1981 that Waste Management (WM) planned to store toxic chemicals in the neighboring port of Mobile for burning in its incinerator ship, the Vulcanus II. WM was transporting Hooker Chemical waste from Love Canal to Mobile for a "test burn" to get an EPA permit for the ship. Trucks would run right through town, an immediate concern, plus WM planned to build two 800,000 gallon storage tanks in the port.

In 1982, the Chickasaw Community Affairs Group got mobilized and their first action was to stop construction of the storage tanks. They discovered that the Teamsters' Pension Fund owned the land where WM wanted to build its storage facility and WM needed their permission (the Teamsters didn't know they owned the land). Further, EPA planned to waive restrictions on having such a facility in a 100-year flood plain which was not subject to EPA waiver. Between this and the Teamsters' support, CCAG blocked truck traffic through town.

Through ordinances from both the Chickasaw and Mobile City Councils, CCAG got the following restrictions imposed on WM's trucks:

- The hauler must notify the Chickasaw police chief in advance of route and time, and go to a police designated "staging area" and only move under police escort (hauler pays for the escort). While waiting for the escort, police and the trucker must inspect the vehicle for leaks and defects. If any are found, the trucker can't proceed unless the trucking company posts a $10 million bond cover any potential damage.
- When traveling through Chickasaw, trucks keep 150 feet away from the nearest vehicle, with the exception of their police escort.
- Headlights on, two-way radio going. Trucks must be marked according to DOT and RCRA rules and drivers must give police their RCRA manifests.
- Only two streets led into the Port of Chickasaw and trucks are banned from one of them. On the other, Viaduct St., there's a "gross vehicle weight limit" of 30,000 lbs., enforced by new weigh stations at either end of a rickety bridge. This limit is lower than the average WM truck and when WM complained they were told to get smaller trucks. The AL Highway Department recommended the limit be further lowered.
- Waste trucks can't travel through the area when it's raining, has rained or is forecast. Same for freezing conditions, hurricane or tornado warnings or watches and wind conditions of 50 mph or more.
- Mobile City Commission totally banned hazardous waste shipments from the city limits.
- Truck speed limits: 40 mph (Interstate), 30 mph (state highway), 20 mph (city street) and trucks can only use the roads between 9:30 a.m. and 3:30 p.m.

Waste Management dropped not only Chickasaw and Mobile from its dockside candidates list for the Vulcanus II, but all Alabama ports! After WM lost in Chickasaw and Mobile, they looked at other Alabama sites, but CCAG encouraged local people to take similar measures. CCAG celebrated its victory with a

ceremonialburningoftheblackribbonsandbanners that were draped all over the county as symbols of their fight.

FormoreinformationonwhatCCAGsuccessfulordinance, contact CHEJ.

"CHEJ is the strongest environmental organization today – the one that is making the greatest impact on changing the way our society does business."

Ralph Nader

"CHEJ has been a pioneer nationally in alerting parents to the environmental hazards that can affect the health of their children."

New York, New York

"Again, thank you for all that you do for us out here. I would have given up a long time ago if I had not connected with CHEJ!"

Claremont, New Hampshire

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