

# HAZARDOUS WASTE NEWS #82

From RACHEL: Weekly news and resources for citizens fighting toxics -- June 20, 1988

## INCINERATION OF INFECTIOUS WASTE

In 1985, there were 6872 hospitals in the U.S. with 1.3 million beds. If beds are occupied 70% of the time and each occupied bed creates 13 pounds of waste per day, U.S. hospitals produce 2.2 million tons of waste per year. An estimated 15% of this is infectious waste containing human anatomical waste, plus garments, gauze pads, diapers, catheters, and so forth. But the infectious 15% cannot be segregated from the non-infectious, so it all gets mixed together, creating a larger mass that must all be considered infectious.

An estimated 90% of all hospitals run their own incinerators; this means about 6,200 neighborhoods are impacted by such machines. From the viewpoint of people living near hospitals, there are five items of concern: (1) the emission of bacteria or viruses that might make people sick; (2) the emission of low molecular weight organic molecules (trichloroethylene [a suspected carcinogen], and tetrachloroethylene, among others); (3) the emission of high molecular weight organic molecules, (so-called "products of incomplete combustion," benzopyrenes, PCBs, polynuclear aromatic hydrocarbons and other polycyclic organic matter, much of which is carcinogenic); (4) the emission of toxic particles small enough for a person to breathe deep into their lungs; (5) and the emission of dioxins and furans.

The U.S. Environmental Protection Agency (EPA) recently released a report completed under contract by the Radian Corporation. The aim was to gather what is known about pollution from hospital incinerators. The authors searched the scientific literature, and interviewed many knowledgeable experts: staff of regulatory agencies (EPA, state and local), the American Hospital Association, and incinerator vendors.

Of the estimated 6200 hospital incinerators in use, perhaps 1200 are large incinerators (burning more than 400 pounds per hour or 400 tons per year) and 5000 are smaller. Hospital incinerators fall into three types: rotary kiln, excess air and

starved air. By far the commonest (especially among units installed during the last 15 years) is starved air (also called "controlled air," "two-stage" and "modular"). Excess air incinerators (also called "pyrolytic incinerators," and "multi-chamber incinerators") come in two types: large units, which are generally "in-line," and smaller units, which are generally "retort" types.

Radian could find no air emissions data for small excess-air incinerators, the kind that serve perhaps 75% or more of the nation's hospitals. Therefore, the remainder of this article describes air emissions from large controlled-air incinerators.

Even among these few incinerators, the lack of data is shocking. Let's look at the five categories mentioned above.

Bacteria and viruses. You might think emission of disease-causing organisms (pathogens) from hospital incinerators would be the subject of intense scrutiny. Not so. The Radian corporation could find only two studies in the scientific literature. One study found twice as many bacteria leaving an incinerator smoke stack as were found in normal outdoor air (though the results were not statistically significant; in other words, they may have occurred by chance). The second study showed that, in a two-chamber incinerator, the temperature in the first chamber has to be 1400 degrees Fahrenheit and in the second chamber had to be 1600 deg. F. to guarantee sterilization of bacteria and viruses. (Many incinerators are not designed to exceed 1400 deg. in their secondary chamber, so presumably do not effectively sterilize wastes they burn.) That ends the discussion of bacteria and viruses in the Radian study. The entire section on pathogens takes up 14 lines of text in a 151-page report.

Low molecular weight organic compounds: Radian says, "One large data gap in the current hospital waste incinerator emissions data base is for lower molecular weight organic compounds." End of discussion.

Products of incomplete combustion, benzopyrene, PCBs and other carcinogenic organic molecules: These pollutants are "important," says Radian, but are not

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included in the study "due to lack of emissions data."

**Tiny toxic particles:** A micron is a millionth of a meter (and a meter is about a yard). If you breathe particles (soot) in the size range of 2 to 10 microns in diameter, they are filtered out by the respiratory system (nose, esophagus, etc.) and are moved into the mouth, then swallowed. Particles smaller than 2 microns are considered "respirable" because they can enter the deep lungs. The smallest particles (1 micron or less) enter the deepest part of the lung, the alveoli, the 3 million little sacs that pass oxygen into the blood and let carbon dioxide pass back out. Particles that enter the alveoli may eventually be removed by natural cleansing mechanisms, or they may lodge there, contributing a grey color to the normally-pink lungs, or they may actually pass into the blood stream and go someplace else in the body.

As luck would have it, the respirable particles from an incinerator contain more than their fair share of toxic materials, especially toxic metals and the often-carcinogenic polycyclic organic molecules. The small particles have a larger surface area in relation to their bulk than do larger particles. (A physicist would say small particles have a larger surface-to-volume ratio.) The relatively large surface area of the smallest particles attracts toxic heavy metals during combustion. Thus, respirable particles end up loaded (Radian says "enriched") with lead, arsenic, cadmium, chromium and other dangerous metals. (Radian presents no data on enrichment by polycyclic organics, unfortunately.) Thus the particles that reach deepest into the lungs are the most toxic.

Typical hospital incinerators emit 1.5 to 36 pounds of particles per ton of waste incinerated. (Incidentally, bacteria and viruses have diameters ranging from 0.4 microns down to 0.02 microns, so they are definitely respirable.)

**Dioxins and furans:** The Radian study describes in detail the combustion conditions under which dioxins and furans will be formed. They conclude that the primary chamber of a hospital incinerator is perfect for manufacturing dioxins and furans, and that safety depends upon the secondary chamber completely destroying the dioxins by maintaining ideal combustion conditions. They conclude that the average amount of total dioxins emitted from a 1000 pound-per-hour hospital incinerator operating 2000 hours per year would be 3.7 grams of dioxin per year. (There are 28 grams in an ounce.) This may not sound like much, but dioxin is considered extremely toxic, so it may be a lot, depending on where it goes once it is released into your neighborhood.

**Conclusion:** The nation's primary medical care institutions are almost all operating incinerators without knowing what they are doing, literally. The data are simply not available. What data there are, on respirable particles and dioxins, indicate the need for very tight air pollution control, which is not provided under federal law, nor under most state laws. In short, hospital incineration of infectious wastes is a scandal.

To get your free copy of Radian's Hospital Waste Combustion Study, Data Gathering Phase, Final Draft Report, write Ray Morrison, Pollutant Assessment Branch, Office of Air Quality Planning and Standards, EPA, Research Triangle, NC 27711; phone (919) 541-5332.

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