Editorial

Infectious Waste Management — Will Science Prevail?

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One frustrating aspect of infectious diseases is the basic irrationality with which they are frequently handled. Most people have inherent fears regarding infections and all too often the fears are intensified by individuals with little knowledge of infectious diseases and by sensationalized media reports. They may be amplified by opportunists who have something to gain from the issue. Such is the case with infectious waste management.

Over the years, there has been considerable concern and confusion regarding the risks associated with the disposal of hospital wastes. This confusion has been compounded by the absence of a specific definition of infectious waste. In addition, numerous documents at local, state, and federal levels have been drafted or written to deal with this issue, but many have been based on personal opinion, politics, and emotions that often center around a misunderstanding of human immunodeficiency virus (HIV) transmission and survival. Media hype and encouragement by a politically powerful waste management industry have often guided the content of these documents. They commonly have been developed with good intentions, but frequently without scientific risk/benefit analysis.

In 1987, legislative hearings were held to determine if there should be federal regulation of infectious waste. The majority of those who testified demonstrated that regulation was unnecessary. Recent reports of medical wastes washing up on the beaches along the East Coast have stimulated renewed concerns. In the summer of 1988, the Environmental Protection Agency (EPA) solicited broad-based input into the need for regulation of these wastes.[1] As of August 1, 1988, the EPA had received over 100 public comments.[2] No commentator presented evidence suggesting that properly handled and disposed medical waste posed a public health problem. In its response to the EPA, the American Hospital Association (AHA) went a step further and suggested that instead of establishing federal regulations, the EPA act as a coordinating body for all relevant federal, state, and local agencies. The EPA could provide model language, oversee the consistency of definitions, and possibly develop a model infectious waste management program.[3]

This is not the first time this issue has been reviewed by the EPA. In 1985-986, the EPA and the Centers for Disease Control (CDC) released guidelines, developed by experts, to deal with this issue in a more scientific manner.[4,5] The opening paragraph of the statement prepared by the CDC states, "There is no epidemiologic evidence to suggest that most hospital waste is any more infectious than residential waste. Moreover, there is no epidemiologic evidence that hospital waste disposal practices have caused disease in the community; therefore, identifying wastes for which special precautions are indicated is largely a matter of judgment about the relative risks of disease transmission." This statement is profound because it focused on the absence of scientific evidence even to suggest any environmental or community risk associated with present hospital waste disposal practices.

Studies indicate that the bacterial concentration of different types of hospital waste has 10 to 100,000 times less microbial contamination than household waste.[6] Hospitals have traditionally used care when handling and disposing of wastes that represent a potential risk of disease transmission. It has long been recognized that specific hospital wastes do present occupational hazards to those who directly handle them. Microbiological waste, blood/body fluids, sharps, and pathologic wastes are universally treated as occupational hazards within health care facili-

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ties. Incineration and autoclaving of materials thought to be hazardous is common. William Rutala, PhD, MPH, CIC, of the University of North Carolina, conducted a survey in July, 1987 and January, 1988 in which he randomly sampled 20% of US hospitals in 49 states. The results showed that 85% of US hospitals studied discarded blood, microbiology waste, sharps, and pathology waste in accordance with CDC policy. In fact, many hospitals had excessively inclusive definitions of infectious waste.[3] The EPA has developed a common-sense definition of infectious waste which includes factors necessary for induction of disease. They define infectious waste as "waste capable of producing 2111 infee-1iO~l.S disease."[4] This definition requires consideration of certain factors necessary for induction of disease. They include: (a) presence of a pathogen, (b) sufficient virulence, (c) dose, (d) portal of entry, and (e) susceptible host. It is important to recognize that all five factors must be present simultaneously for infection to occur.

If regulations are forthcoming or if the EPA accepts the advice of the AHA, and the above definition is strictly adhered to, categories of waste for which special handling is necessary can be developed. Before discussing them, one must remember that the 1986 EPA guidelines include this definition, but it was not applied consistently in that document. One can assume that the political climate required compromise instead of consistency. When this definition is followed stringently, the following comments can be made about the commonly used categories of waste materials listed below.

All discarded *sharps*, such as needles and scalpels that have come into contact with infectious materials, should be considered as infectious waste. The risk of infection from these devices is related to contamination with potentially pathogenic materials and the provision of a portal of entry into a host via a puncture or cut. These devices should always be disposed of in rigid puncture-proof containers. While sharps present a real occupational hazard, the environmental risk they pose, if disposed of properly, is negligible.

Cultures and stocks of infectious agents should be designated as infectious waste because of the high concentratiott of pathogenic organisms typically present in these materials. They are generally stored in glass containers that, if broken, become contaminated sharps. Autoclaving or incineration are the commonly accepted methods of treating this material.

All human *blood* and *blood products*, including serum, plasma, and other components known or suspected to be contaminated with a transmissible agent, must be handled carefully. Many institutionalized patients have infectious diseases that are undiagnosed; therefore, it is prudent to handle the blood, blood products, excretions, and secretions of all patients carefully. However, small amounts of these materials dried on dressings or other disposable items represent an insignificant hazard once they have been properly contained.[5] This is because of the absence of the portal of entry and means of transmission.

Bulk blood, blood-tinged suctioned fluids, excretions, and secretions are considered infectious because they may be splashed into a mucous membrane, or the container may break and thus become a contaminated sharp. However, these bulk materials may carefully be poured down a drain connected to a sanitary sewer. In some communities, the level of emotion has been so high concerning this issue, it has been suggested that blood be prohibited from being discharged into a sanitary sewer. Obviously, these concerns are illogical and unfounded since the sanitary sewer was actually designed for the disposal of human waste.

Pathology wastes present more of an aesthetic problem and do not pose a risk of infectious disease transmission to the public. Grinding and discharging into a sanitary sewer or incineration are acceptable means of treating this waste.

Wastes from an isolation patient represent no greater risk of disease transmission than other hospital or residential waste. This year, in a study presented at the annual conference of the Association for Practitioners in Infection Control, investigators from the University of Massachusetts Medical Center presented data showing that the levels of contamination were comparable between isolation trash and trash from patients receiving standard care.[7] Patients are often isolated because of conditions that allow for disease transmission within the hospital but are unassociated with their wastes. For example, patients with chicken pox are often placed in strict isolation because the organism may be airborne or transmitted to the nonimmune care giver having direct contact with the lesions. However, the organism that causes the disease does not survive in the environment, thus the patient's waste does not pose a hazard. A patient with a wound infection caused by any number of different organisms will frequently be placed on drainage and secretion precautions to prevent care givers from carrying the infecting organism from one susceptible patient to another. Once the dressing from the wound is properly contained, the mode of transmission and portal of entry are no longer present. It is important to note that the organisms that survive in the environment most often belong there! *Pseudomonas, Klebsiella*, and other common hospital pathogens can be found in many different environmental reservoirs, such as water, soil, household garbage, and the like, and in much greater quantities than in a wound dressing.

Miscellaneous waste, such as dialysis, surgical, and laboratory wastes, should not be considered as infectious waste except for sharps, bulk blood, and blood-tinged suctioned fluids. Once they are properly contained, they are no more hazardous than any residential waste for the same reasons that are listed above for isolation wastes.

It has been difficult to develop a consistent scientific definition of infectious waste because the persons who have traditionally developed policies for dealing with various types of waste have been individuals with backgrounds in safety, engineering, chemistry, and the environment. They have not been persons knowledgeable about epidemiology, microbiology, or infectious diseases, and therefore, their approach to this issue is not always scientific, cost-effective, or prudent. Many of those who are responsible for developing regulations are politically oriented. Politicians with the "NIMBY" (not in my backyard) syndrome often push illogical legislation in

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response to encouragement by frightened constituents or by politically active waste disposal firms with ulterior motives or fears of their own. Some have suggested that because hospitals are using universal precautions for contact with all blood and body fluids that all hospital waste be considered infectious. This approach cannot be justified on a scientific or cost-effective basis. The concept of universal precautions has been developed to prevent occupational exposure of mucous membranes and nonintact skin to blood-borne diseases by utilizing barrier precautions.[8] The risk of intense and frequent contact with blood in the health care setting is high. As stated above, however, once the waste is properly contained and in the absence of gross negligence by the waste hauler, two essential factors for disease transmission -- mode of transmission and portal of entry -- are no longer present. The cost of handling infectious waste may be 20 to 50 times higher compared with other waste.[3]

The recent occurrence of needles, syringes, and vials of blood-contaminated objects washing up on the shores of our lakes and beaches is appalling to everyone. However, before reacting irrationally, it is important to understand some of the forces that drive these waste disposal practices. This problem has been traced primarily to small-quantity generators and "midnight" dumpers. On the East Coast, it is not uncommon for air pollution standards to be so demanding that hospitals have been unable to afford the costs of operating their own incinerators. Landfill capacity is extremely diminished and they are frequently closed to hospital waste. The alternative is to hire a waste hauler who is licensed to handle this type of material. Unfortunately, once they pull away from the curb, the health care facility has little or no control over the final destination of the materials.

In order for this issue to be dealt with in a cost-effective, scientific manner, epidemiologists, infection control practitioners, microbiologists, and infectious disease specialists must become involved on federal, state, and local levels. Some legislation is inevitable, and without knowledgeable input, it surely will be irrational. My experience suggests that in the absence of persons with an understanding of the principles of infectious disease and microbiology, ignorance and irrationality will prevail. The results in terms of cost to the health care industry and to the consumer could be severe. Will science prevail?

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