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Occupational infectious diseases
Still a challenge

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Occupational infectious diseases remain an important challenge, even in industrialized countries where there has been a dramatic decline in the morbidity and mortality associated with infectious disease. Occupational diseases are contracted through employment [1], and many infectious diseases are associated with transmission in the occupational setting. Occurrences of some diseases are strongly associated with certain types of workers (eg, zoonoses in animal handlers). Other diseases occur most often in the general population but also can be acquired at work (eg, influenza, tuberculosis). Occupational infectious diseases are an important cause of morbidity and occasional mortality in workers [2–4].

Many emerging problems with infectious diseases have a great impact on the workplace. The HIV pandemic, which affects approximately 40 million people worldwide [5], and global increases in tuberculosis (TB), which affects about one third of the world's population [6], have caused great concerns for healthcare workers. The anthrax attacks of 2001 heightened concerns about the impact of biologic warfare on non-healthcare personnel, such as postal workers. Emerging vector-borne diseases, such as Lyme disease and West Nile virus infection, have been a concern for outdoor workers.

Despite the persisting threat of occupational infectious disease, opportunities exist to prevent disease. Many factors contribute to the transmission of infectious diseases in the workplace. Unsafe work practices, overcrowding, inadequate ventilation or plumbing, and unavailability or misuse of personal protective equipment can contribute to acquisition of infection. Many prevention strategies may be applicable in the workplace, such as administrative interventions,

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engineering controls, protective equipment, medical screening and surveillance, and education. TB prevention in hospitals demonstrates the effectiveness of using multiple preventive modalities to stop the transmission of infectious diseases in the workplace [7,8]. Occupational infectious diseases continue to be an important and timely subject. Prevention of familiar and emerging diseases remain important challenges.

General challenges

Surveillance

Surveillance systems, such as the National Surveillance System for Health Care Workers, have great usefulness in guiding public health efforts against occupational infectious disease [9]. Organized surveillance enables clear identification, quantification, and documentation of the risk factors that are associated with a problem. It also helps determine whether an intervention is effective or whether trends suggest improved or worsening status of a problem (see article by Jagger and Perry elsewhere in this issue).

Organized surveillance that is not focused on a particular industry or disease can identify previously unanticipated issues. In the United Kingdom in 1996, surveillance across a broad range of occupational settings identified diarrheal diseases as the most frequently acquired infectious diseases in occupational settings. Scabies ranked second in frequency [10]. Identifying previously unrecognized associations between occupation and infectious diseases makes it possible to target prevention efforts and reduce the occurrence of disease.

Fostering healthy work environments

A workplace culture that values and supports health and safety is of great aid to disease prevention. Management staff and workers have key roles in the development of such a workplace milieu. Challenges to management include application of modes of prevention, such as administrative controls, environmental controls, personal protective equipment, screening and surveillance, vaccinations, and training; such methods can be associated with a substantial financial commitment. Challenges to workers include adherence to health and safety procedures and communication of potential problems to management staff. Communication between management staff and workers is of great importance and most likely will occur if workers are not concerned about any negative repercussions of engaging in discussions about health and safety issues. Maintaining this type of positive work environment is an important challenge for all employees. Elsewhere in this issue, Hubbard and Ross discuss the complexity of balancing the legal, social, and political issues associated with occupational transmission of infectious diseases and efforts to prevent such transmission.

Using effective preventive interventions

Preventive interventions in occupational infectious disease should be based on sound scientific data. Formal evaluation of prevention effectiveness provides an important scientific framework for making often difficult decisions about resource allocation [11]. To the extent possible, efforts at prevention should be grounded in analysis of cost benefit, cost usefulness, and cost effectiveness.

Maintaining a global outlook

Infectious diseases are a global concern. Unfamiliar diseases that originate elsewhere in the world can impact the United Stages with unexpected speed and severity, as demonstrated by the West Nile virus outbreak [12]. As previously noted, infectious diseases such as HIV infection and TB are massive global problems. Global infectious disease problems have direct bearing for two US occupational groups: workers of international origin and US workers who travel abroad. As a result of exposure to endemic diseases in their countries of origin, international workers may be at greater risk for problems such as TB than are their domestic counterparts [13]. Depending on the region to which they are going, workers who travel may require preventive therapies, such as vaccinations or prophylactic antibmicrobial treatment, and may be at risk for infections that are unfamiliar to US physicians [14]. An additional reason for global vigilance is that new and emerging infectious disease threats, such as Ebola virus, can originate anywhere in the world (see article by Hubbs elsewhere in this issue). Maintaining global awareness is critical in guiding proactive steps to protect US workers and the general population.

Specific challenges

Blood-borne diseases

Blood-borne diseases such as HIV, hepatitis B virus, and hepatitis C virus (HCV), are challenging occupational infectious diseases. They are transmitted by exposures to blood or body fluids [15–18] and are known best as threats to healthcare workers who directly provide medical care in hospitals and clinics. Workers who are involved in a wide variety of other activities (eg, clerks, administrative and maintenance workers, students, volunteers) are at risk, as are workers in other settings where healthcare or other services are provided (eg, home healthcare workers, laboratory workers, community service workers such as the police, waste haulers, body piercers, correctional personnel). Many important knowledge gaps remain in this area. Vaccines are not available for HIV and HCV. The appropriate regimen and timing of antiviral therapy for early (acute) HCV infection is unclear [19], as discussed by Kindrick et al elsewhere in this issue. Development and assessment of new control technologies to reduce needlestick and sharp-instrument injuries continues to evolve [20]. Prevention of

occupationally related transmission of blood-borne pathogens continues to be an important and dynamic area. Articles by Huy et al, Gershon and Green-McKenzie, and Gershon et al elsewhere in this issue delineate the many challenges associated with the prevention of the transmission of blood-borne infectious diseases in occupational settings.

TB in healthcare workers

Prevention of TB in healthcare delivery and other settings (such as correctional facilities and homeless shelters) has been a controversial area [8,21]. A resurgence of TB occurred in association with the HIV epidemic of the early 1990s. This resurgence in the general population was associated with numerous reports of TB outbreaks in exposed healthcare workers. In 1994, the Centers for Disease Control and Prevention established a comprehensive set of guidelines to be used by healthcare facilities for developing TB prevention plans tailored to their individual institutions [7]. TB rates subsequently have declined in the general and healthcare-worker populations. A report from the Institute of Medicine found that "where tuberculosis is uncommon or where basic infection control measures are in place, the occupational risk to health care workers of tuberculosis infection now approaches the level in their community of residence." The report also found that "tuberculosis remains a threat to health care and other workers, especially when workplaces neglect basic infection control measures and when multidrug-resistant disease is present" [8]. Controversies and current challenges associated with prevention of TB in the workplace are addressed in an article by Palmore and Sepkowitz elsewhere in this issue.

Biologic warfare agents and bioterrorism

The anthrax attacks of 2001 were a grim lesson that the threat of bioterrorism is more than just theoretical. The impact of a bioterrorist attack on society extends beyond the actual physical toll. Accompanying stress, fear, panic, and hoaxes can be damaging [22,23]. Biologic warfare has a long history, and much is known about responding to attacks [23]. The real-world experience of the 2001 anthrax attacks demonstrated important knowledge gaps and challenges. Occupational groups that were at risk included unanticipated victims, such as postal workers. The emerging challenge of bioterrorism is covered at length in a previous edition of this journal.

Zoonoses

Zoonoses continue to be an important challenge. Avian influenza, hantavirus pulmonary syndrome, hemorrhagic fevers such as Ebola virus, and West Nile virus are examples of zoonoses that became serious general infectious disease concerns. Many biowarfare agents are zoonotic pathogens. Zoonoses are addressed in the articles by Hubbs and by Guidotti and Naidoo.

Other occupational infectious disease challenges

Many infectious diseases can be associated with occupational transmission [2–4]. New challenges, such as those investigated in workers exposed to biosolids [24], will continue to emerge. Workers with compromised immune function are also sources of emerging concern [25].

Summary

Occupational infectious diseases continue to be an important challenge. Healthcare workers and other groups remain at risk for blood-borne pathogens, tuberculosis, influenza, and other infectious processes. Biologic warfare agents and bioterrorism have emerged as important concerns for first responders and other healthcare personnel. Several zoonoses with the potential for occupation-related transmission are emerging. Although these diseases are great challenges, opportunities for prevention exist. To take advantage of these opportunities is the greatest challenge of all.

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Appendix 2

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If this manuscript reports a study that involved research on human subjects, was IRB approval obtained?
[ ] Yes [ ] No [ ] Determined to be Exempt [x] Not applicable
Does this research constitute a new discovery, e.g., a new device, biologic or chemical composition, method, or one or improvement of existing technology? [ ] Yes [x] No
If "Yes" has an Employee Invention Report (EIR) (HHS 0346, Rev. 1/85) been filed with CDC's Technology Transfer Office?
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