Editorial

Antibiotic-Resistant Bugs: When, Where, and Why?

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Emerging infectious diseases are changing the public's perceived vulnerability to infectious agents. Recent best-selling novels and movies portray the human race as being at risk of devastation due to the introduction of an infectious agent similar to the "Andromeda strain." Furthermore, much of the popular media coverage of this topic employs the use of sensational language (eg, "flesh-eating strep") or scenarios that are not based on existing scientific evidence (eg, the changing modes of transmission of a viral agent due to mutation in the movie *Outbreak).* The public is left with the sense that a major infectious disease catastrophe is waiting to happen. Often, we forget that such a catastrophe is in our midst; unfortunately, we have come to accept AIDS as part of the "health fabric" of the 1990s.

Meanwhile, there are other, somewhat more subtle, changes occurring in our relationship to infectious agents today that have been recognized by clinicians and public health practitioners, but of which the public has little awareness. In part, this has occurred because we have only limited information as to the extent of the risk these changes pose to human or animal populations. Most notable of these issues is the expanding development of antimicrobial resistance among viruses, bacteria, fungi, and parasites.

In 1994, the American Society for Microbiology (ASM) named a task force to review the problem of antibiotic resistance. The task force first met in July 1994, and a report of their findings has been published recently.[1] The ASM Task Force report builds on previous reports that have detailed the emergence of antibiotic resistance.[2] The ASM report concludes that "although defining the precise public health risk of emerging antibiotic resistance is not a simple undertaking, there is little doubt that the problem is global in scope and very serious."

Some of the more striking examples detailed in the ASM report include the following: 1) Today, in the US, more than 90% of strains of *Staphylococcus aureus* are resistant to penicillin and other beta-lactam antibiotics; 2) the incidence of vancomycin-resistant enterococci in the US increased 20-fold from January 1989 to March 1993; and 3) the prevalence of antibiotic-resistant *Streptococcus pneumoniae* has increased substantially in certain regions of the United States in the past 5 years.

The ASM report emphasizes that there currently is no adequate national or global surveillance system for monitoring antibiotic resistance in humans or animals. This conclusion is based on a recent survey conducted by the Council of State and Territorial Epidemiologists, which demonstrated that in 1992 less than $55,000 was spent in the US by federal, state, and local public health officials for systematic surveillance of antibiotic resistance among human pathogens.[1] The task force identified the lack of national surveillance data as a major hindrance to understanding and controlling this problem.

The article in this issue of *Infection Control and Hospital Epidemiology* by Paul et al demonstrates the ability to conduct statewide surveillance for antibiotic-resistant bacteria in New Jersey. Their work represents an important first step in addressing the current lack of surveillance data.[3] In their study, they were able to demonstrate that it is possible for state public health officials to conduct active laboratory-based surveillance for selected infectious disease agents. In this case, they report on the frequency of methicillin-resistant *S aureus* (MRSA) found in acute-care hospi-

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tals in their state. The authors demonstrate that the rate of MRSA blood isolates is an accurate surrogate marker for the incidence of MRSA blood infections in the hospitals participating in surveillance. Of note, all 96 acute-care general hospitals in New Jersey reported MRSA isolate data to the state health department. This effort marks a major departure from previous efforts by public health agencies to monitor antibiotic resistance on a population basis.

Until the emergence of multidrug-resistant tuberculosis and expansion of the problem with antimicrobial-resistant gonorrhea in the 1980s, public health epidemiologists tended to see the issue of antibiotic resistance as one to be left predominantly in the clinical domain. Thus, most of the national data generated on antibiotic resistance among patients in acute-care hospitals came from specific studies conducted by the Centers for Disease Control and Prevention (ie, the National Nosocomial Infection Surveillance System) or the Veterans Administration hospitals. Other studies have been conducted by researchers in individual hospitals or by researchers involving limited populations in relatively small geographic areas. None of these past efforts have provided a comprehensive population-based overview of antibiotic resistance on a regional or national level.

It is clear from the ASM Task Force report that the increase in antibiotic resistance of a number of important human and animal pathogens has been dramatic during the past several years. With the relative use of available antibiotics eroding, the balance is being tipped in favor of multidrug-resistant pathogens. Of great concern is that few new antibiotics are in the pipelines of US pharmaceutical companies.

What can and should be done? Recommendations from the ASM Task Force may be summarized in three specific areas. First, an urgent call is being put forward for the establishment of a national antibiotic resistance surveillance system that includes data from humans, animals, and food products. Second, professional and public education should be strengthened in the area of infectious diseases and antibiotics so as to reduce inappropriate use of antibiotics. Finally, there is an urgent need for more basic research directed toward development of new antimicrobial compounds, effective vaccines, and other prevention measures. The foundation needed to justify these latter two recommendations and to generate needed support from policymakers will be strengthened by our ability to fully realize the first recommendation: establishment of a national antibiotic resistance surveillance system.

The New Jersey experience demonstrates that useful and valid population-based surveillance data on antimicrobial resistance can be collected by a public health agency. The efforts in New Jersey and other states can, and should, pave the way toward expanded surveillance at the state level and, ultimately, toward national surveillance. We would like to offer the following three suggestions on the implementation of surveillance for antimicrobial resistance.

First, methods aimed at capturing all referral sources need to be standardized. Our experience in Minnesota suggests that obtaining information only from hospital laboratories will be inadequate to fully describe this growing problem. For example, as cost containment efforts continue, we have found that an increasing number of hospital laboratories no longer conduct in-house antibiotic resistance testing. Rather, with the increased emphasis on outpatient management and the development of centralized private laboratories, we are finding that an increasing number of hospitals no longer provide these services. Of the 163 hospitals in Minnesota, 90 send at least some of their clinical isolates to other laboratories for antibiotic resistance testing. While most of these laboratories forward isolates to other hospital laboratories, at least 35 hospitals in our state use nonhospital reference laboratories. In some instances, these laboratories actually are located in another state. Thus, before any statewide surveillance system is undertaken, it is essential to determine where antimicrobial resistance testing of clinical isolates occurs, and how such information can be obtained.

Second, we must place greater emphasis on the use of standardized methods for the determination of antimicrobial resistance, employing rigid quality controls. As suggested in the ASM Task Force report, it will be important for such groups as the National Committee for Clinical Laboratory Standards to develop and promote the use of standardized procedures for antibiotic sensitivity testing that can be applied on a nationwide basis. Without such an effort, it will be difficult to interpret information from different laboratories. At the very least, information on laboratory procedures needs to be collected as part of surveillance data so that comparisons can be made.

Finally, we believe it is important to make those infectious agents that are of public health importance and those with the greatest likelihood for developing resistance legally reportable to state and local health departments. While the current reportable disease surveillance system in this country is crumbling, we must find a way to invest in this type of infrastructure if we are going to be able to respond to this important clinical and public health challenge. Although Paul et al did not employ a system that allowed identification and reporting of patients from whom isolates were obtained, we believe ultimately that only a system with

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patient identification will be able to provide unduplicative data, particularly in areas with increasing laboratory consolidation. We currently are evaluating such a surveillance effort in Minnesota and believe that this approach is useful and workable.

The increasing problem of antimicrobial resistance will be a major challenge for the medical and public health communities over the next decade. Without the combined and collaborative efforts of private and public medical laboratories, clinicians, pharmaceutical companies, and public health practitioners, the problem of antimicrobial resistance will spread in scope and seriousness at an ever more rapid pace. Given the current available information on the rapid expansion of antimicrobial resistance of a number of important clinical pathogens over the past 5 years, we may well be entering those first days of the "postantibiotic era." Timely and comprehensive public health surveillance for antimicrobial-resistant organisms on a national basis is critical if we are to better understand the burden of illness related to these pathogens, find appropriate treatment approaches, detail other interventions to reduce the incidence and prevalence of resistant pathogens in our human and animal populations, and determine the role of vaccine development in addressing this problem.

REFERENCES

1. American Society for Microbiology. Report of the ASM Task Force on Antibiotic Resistance. Washington, DC: ASM; 1994.
2. Institute of Medicine. *Emerging Infections: Microbial Threats to Health in the United States*. In: Lederberg, Shope. Oaks, eds. Washington, DC: National Academy Press; 1992:92-101.
3. Paul SM, Finelli L, Crane GL, Spitalny KC. A statewide surveillance system for antimicrobial resistant bacteria: New Jersey. *Infect Control and Hosp Epidemiol 1995;16:385-390.*
4. Berkelman RL, Bryan RT: Osterholm MT, LeDuc JW, Hughes JM. Infectious disease surveillance: a crumbling foundation. *Science* 1994;264:368-370.

OSHA's TB Standard To Be Peer-Reviewed

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The Occupational Safety and Health Administration (OSHA) has delayed its proposed tuberculosis standard so that the standard may be peer reviewed in accordance with a requirement in the regulatory reform legislation being considered by Congress. The risk-assessment portion of a standard must show that evidence exists for significant risk of health impairment if existing conditions are not reduced or eliminated.

OSHA announced that the four individuals chosen to review the standard's risk-assessment provisions were George Comstock, professor of epidemiology at Johns Hopkins University; Patricia Siione, deputy chief of the program services branch of CDC's Division of Tuberculosis Elimination; Neil Graham, associate professor of epidemiology at Johns Hopkins University; and Bahjat Qaqish, associate professor of biostatistics at the University of North Carolina. The comments of the panelists will be taken into consideration before the proposed rule is pub lished.

According to the agency, the draft risk assessment and the reviewers' comments will be published in the *Federal Register,* along with the proposed standard, in October 1995.

OSHA's Deputy Assistant Secretary James W. Stanley acknowledged that the healthcare industry has made considerable progress in addressing concerns about TB transmission in the workplace.

FROM: Bureau of National Affairs. Panel named to review tuberculosis proposal. *Health Law Reporter* May 24, 1995:A12-A13.

FLASH! Late-Breaking News

by Gina Pugliese, RN, MS
Medical News Editor

On June 7, 1995, OSHA announced that the proposed revised Respiratory Protection Standard will not apply to tuberculosis protection. Rather, the current Respiratory Protection Standard will govern TB protection until a formal TB standard is adopted. Once final, however, the revised Respiratory Protection Standard will govern all other respiratory exposures (chemical, toxic, etc) in the healthcare industry.

Effective July 10, 1995, NIOSH will begin certifying a new class of respirators (now called 95N) that may be used instead of HEPA for tuberculosis protection. These long-awaited respirators are likely to reach the market by August or September.

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