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Twin Epidemics of Multidrug-Resistant Tuberculosis: Russia and New York City

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Tuberculosis is currently one of the leading infectious causes of death in the world, with more than one third of the world's population infected and 8 million new cases each year, resulting in approximately 2 million deaths [1]. It is astonishing to think that only 20 years ago eradication of this disease seemed to be right around the corner. In 1953, shortly after the development of the powerful antibiotic isoniazid for treatment of tuberculosis, the number of cases in the United States began to drop. The United States Congress ceased direct government funding for the tuberculosis programs in 1972, and funding nationwide for prevention, screening, and treatment of the disease was greatly reduced. By 1985, the number of tuberculosis cases had reached an all-time low [2]. Tuberculosis was considered no longer a threat to public health.

Evolving Epidemics

In 1986 the number of new tuberculosis cases in the United States suddenly began to climb. At the same time, a similar phenomenon occurred in the Soviet Union: rates of tuberculosis, also at an all-time low, suddenly began increasing. By the early 1990s, both Russia and New York City had serious problems on their hands.

The factors contributing to these epidemics were remarkably similar in both locations. Russia and the United States had simultaneously decreased funding for programs designed to screen, diagnose, and treat tuberculosis. The transmission of TB is greatly influenced by social factors, and the collapse of the Soviet Union in 1990 with the resulting increase in homelessness, poverty, unemployment, and alcohol abuse facilitated the spread of tuberculosis in Russia. Russia's prisons began to fill with young men who had committed property crimes until the rate of incarceration stood second only to that of the United States [3]. Such overcrowded prisons filled with undernourished men became hot spots for tuberculosis transmission.

New York City, too, was experiencing all-time highs of homelessness, overcrowding, unemployment, and poverty. The newly declared "War on Drugs" filled New York City's prisons with homeless, unemployed, and TB-susceptible men. New York's large immigrant population and increasing rates of HIV infection also added to the quick rise in cases of tuberculosis: many immigrants brought latent tuberculosis with them and developed active disease in the harsh conditions of immigrant life in New York City. Furthermore, HIV infection predisposes an individual to contract tuberculosis and

allows for higher levels of active disease; HIV infection increases the efficiency of tuberculosis as well [4].

By 1993, the World Health Organization declared tuberculosis a global health emergency. It adopted a program developed 20 years earlier by the International Union Against Tuberculosis and Lung Disease (IUATLD) called DOTS, an acronym for Directly Observed Therapy Short Course. The DOTS program has 5 main principles, one of which involves ensuring—literally by direct observation—that each patient takes medication daily. The other principles include sputum smears to test for active pulmonary disease; administration of first-line tuberculosis drugs for 6 months; complete, standardized records of patients and outcomes; and political involvement in patient treatment [5]. Although the program has its flaws and limitations, DOTS should be enormously effective against normal strains of tuberculosis.

Neither Russia nor New York City was experiencing an epidemic of normal tuberculosis. Sporadic and inadequate treatment of patients during the 1970s and 1980s had led to strains of tuberculosis that were resistant to the standard first-line medications—the treatments used in the DOTS program. This distinguished these 2 tuberculosis epidemics from the more persistent and drug-sensitive tuberculosis in Eastern Asia and Africa. Tuberculosis resistant to 2 or more of these first-line drugs—usually isoniazid and rifampin—is classified as multidrug-resistant tuberculosis (MDR-TB). In both Russia and New York, single-drug-resistant tuberculosis and MDR-TB rapidly spread in overcrowded prisons and hospitals that were unprepared for highly infectious patients.

A Tale of 2 Responses

Here the similar stories began to diverge. In New York City, the biggest city in one of the wealthiest countries in the world, a tuberculosis task force was quickly mobilized. Screening, diagnosis, and treatment were provided free of charge. Infectious patients were isolated and nonadherent patients were detained to decrease the development and spread of MDR-TB. When an individual was found to have tuberculosis, the strain was identified and tested for drug resistance, so that the patient could be treated accordingly with second-line drugs [4]. Between 1996 and 2000, 80 percent of New York City's infected patients received the treatment they needed [6].

Not so in Russia and the other countries of the former Soviet Union. These impoverished countries with collapsed infrastructures did not have the resources to mobilize forces against this epidemic of drug-resistant disease. Although doctors in the Soviet Union had previously recognized and treated drug-resistant tuberculosis, medications and resources were in short supply in the 1990s. Russia became heavily dependent on international aid organizations for financial resources and tuberculosis medicines [7]. But international aid organizations were only interested in treating tuberculosis with DOTS. And DOTS was ineffective for MDR-TB.

In fact, DOTS was a spectacular failure in Russia, with cures reported in less than half of all treated patients [7]. This was due not only to high levels of MDR-TB but also to low rates of DOTS coverage because of opposition to the program from policy makers,

clinicians, and patients [8]. Tuberculosis became the leading cause of death in Russian prisons [7].

In 2002, the Green Light Committee (GLC) was established by the World Health Organization to increase access to treatment for MDR-TB. Reducing costs of second-line drugs has made treatment both feasible and cost-effective [9]. Finally, patients in Russia and all over the world are getting the treatment that was available to wealthier countries years before.

Global Implications

No one knows exactly how many cases of MDR-TB exist in the world, but it is estimated that right now 4 percent of tuberculosis cases are resistant to at least one drug. In 2001, approximately 17-25 percent of cases were classified as drug-resistant in Russia. In the penitentiary system, the percentages were much higher: 35-44 percent resistant, and 15-22 percent resistant to 2 or more drugs [3]. Incidence rates of tuberculosis are now falling in Russia and Eastern Europe, but it is difficult to know whether to attribute this downturn to effective treatment or to a general improvement in social factors leading to a decreased susceptibility in the population [5].

Debate continues about the value of testing for and treating patients with MDR-TB in developing countries. Testing for drug resistance requires time and equipment; second-line drugs are considerably more expensive than the first-line drugs, and the treatment course is prolonged from 6 months to 2 years. Some opponents argue that the extra cost of these treatments could be better spent increasing access to first-line treatments [9].

But MDR-TB, by definition, does not respond to the first-line treatments used in the DOTS program. Although cases of tuberculosis can conceivably resolve on their own, a decision not to treat MDR-TB because of the cost of testing or of the drug regimen often amounts to a death sentence for the person suffering from the infection. Furthermore, patients with untreated, active MDR-TB continue to spread their disease within their own families and communities. If they receive ineffective treatment with the cheaper first-line drugs, increased drug resistance may develop thus worsening the cycle.

The control of tuberculosis raises many ethical questions, including the allocation of resources; the dispute between a patient's right to refuse treatment and the protection of the community; and the care of those on the fringes of society, including the homeless, drug and alcohol abusers, and prisoners. One obvious question posed by the twin tuberculosis epidemics in New York City and Russia was whether or not we should use finite financial resources to provide costly treatments to a minority of patients. Is it worthwhile or cost-effective to treat MDR-TB? From both ethical and public health perspectives it is clear that MDR-TB must be detected and treated in poorer countries as it is in wealthier countries, a conclusion that has implications for the treatment of HIV in poor and developing countries [10]. It is also apparent that tuberculosis (like other infectious diseases) will not be eradicated until predisposing social factors like poverty, homelessness, malnutrition, and unemployment are mitigated.

Another lesson learned from these twin epidemics is that we cannot let our guard down when an infectious disease appears to be easily treated or virtually eradicated. Decreased vigilance and lack of funding for tuberculosis prevention and treatment were clear precursors to the epidemics in Russia and New York City. The rate of new cases of tuberculosis in Russia may be on the decline, but efforts cannot be reduced. As more patients receive treatment with second-line drugs, resistance to these drugs will increase, and new antibiotics will have to be developed and distributed to prevent a new, untreatable epidemic. Vigilance must be maintained in the United States as well: although New York is no longer a hot spot for tuberculosis, many citizens exposed to the disease in the 1990s still harbor latent infections that could be activated at any time. As long as tuberculosis exists in the world, immigrants and travelers will bring disease across international borders. It cost approximately \$1 billion to quash the burgeoning epidemic in New York City—a financial burden that could have been avoided with continued screening and careful monitoring of patients taking tuberculosis medications [11].

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