Mirage of Health

Our attitudes toward infectious diseases would benefit from reconsidering some long-held notions we often seem to forget

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Alfred Torrance's *Tracking Down the Enemies of Man* (Alfred Knopf, 1929), Charles-Edward Amory Winslow's *The Conquest of Epidemic Disease* (Princeton University Press, 1943), and Peter Baldry's *The Battle against Bacteria* (Cambridge University Press, 1976) are just three of many similar titles on my bookshelves. Each tells of past campaigns in our quest to destroy and, if possible, exterminate pathogenic microorganisms. The language is military, the determination absolute.

Many medical microbiologists in the front line still see their endeavors, quite understandably, in those same robust terms. Yet a perusal of the contemporary literature also betokens a significant shift in the philosophy underlying our approach to communicable disease. After decades of successful antimicrobial warfare, developments such as the waning power of antibiotics, the appearance of new infections, and the resurgence of old ones seem to be encouraging a new paradigm.

If this paradigm can be traced to the influence of one man, it is that of Rene Dubos, who died in 1982 after spending virtually his entire career at New York's Rockefeller Institute for Medical Research (now Rockefeller University). In his book *Mirage of Health* (Allen & Unwin, 1960), Dubos argued that infectious disease should be seen from an ecological perspective, and not simply as the result of collisions between potent agents and susceptible hosts. Nor should we strive, through antibiosis and antisepsis, to attain a germ-free existence.

It was in this sense that Dubos used the haunting expression which he selected as the title of his book. He did not argue that health was an illusory concept. He did, however, believe (despite his own role in developing gramicidin, the first clinically useful antibiotic) that deploying ever more potent magic bullets was neither the only nor the most effective long-term strategy for dealing with pathogenic microorganisms. The real keys came from ecology, human behavior, and a recognition that microbial and human populations are part of the same evolving biosphere.

Dubos would be pleased to know that one of the few benefits of our current uneasy relationship with pathogens is the reemergence of familiar yet neglected principles of infection control. Thus, a recent report in *Epidemiology and Infection* (**118**:153–157, 1997) shows how a potentially serious epidemic was prevented largely by the one simple measure of isolation. The incident was a rubella outbreak which involved four male British soldiers in Bosnia-Herzegovina, but which could easily have spread to hundreds of other U.K. troops, including nonimmune women, to troops in other nations' peacekeeping forces, and to the local population. All of this was prevented by prompt and rigorous surveillance, isolation, and health education.

Another lesson of this sort was vividly underlined by a report in the *New England Journal of Medicine* a few years ago (**331**:642–648, 1994) of an epidemic of pneumococcal disease in a jail in Houston, Tex. This was not caused by an exotic, hitherto-unknown organism or a multiply resistant superbug. The crucial ingredients were severe overcrowding and inadequate ventiliatlon, which were responsible for the highest attack rates in certain sections of the prison.

Our forebears of a century ago would not have been at all surprised by this discovery. They were robust believers in the virtues of fresh air. The social reformers who attacked slum housing and the benefactors who built the iso-

lation hospitals and breezy tuberculosis sanatoria knew in their bones how to curb the transmission of infection—even before infection was properly understood.

Assessed dispassionately from this broad perspective, present-day Western lifestyles have some extraordinary features. Think, for example, of the cyclic shift in human activity which provides pathogens with the greatest opportunities for dissemination at the very time of the year when we are most vulnerable.

Commuters into cities press together in the highest densities, with closed windows and excess heating, during the winter months when they are most vulnerable to infection. In the summertime, when our resistance is higher, we open our windows and ventilators and enjoy much more space per person. Bus and train carriages are less crowded because people have gone on vacation, many of them seeking isolation at the beach and escape from the crush of the workaday world.

It's odd, too, that our attitudes towards infecting each other are in many circumstances the very opposite of what logic would suggest. We admire tough-minded friends and colleagues who struggle into the office when febrile with a midwinter cold. We make snide remarks about those who stay in bed. And we look upon anyone who declines to shake hands or kiss at a party because they want to avoid passing on a virus as socially peculiar. Perhaps we should be overturning these attitudes and feeling, as John Harris and Soren Holm suggest (*British Medical Journal* **311:** 1215–1217, 1995), a moral obligation not to infect others. Social adjustments would be useful too, such as compensation for lost income.

Another paradox is that we take the greatest risks with foodborne disease in circumstances that pose the highest degree of risk. Whether it's a beach barbecue or a buffet lunch by the hotel pool, we tend to disregard warning signs when we are abroad rather than at home or at least in our own country. But this is precisely the time when we are most likely to be exposed to unfamiliar serotypes—pathogens which, because our immune system is not primed to deal with them, are more likely to cause gastroenteritis.

On one occasion, I observed microbiologists at an international conference dinner, dining from a vast display of meats which they all knew had been laid out for several hours beforehand. There was no refrigeration, and the diversity of densely packed dishes offered excellent opportunities for cross-contamination. The only adverse comment came from one participant who pointed out that meats and sauces at room temperature offered enteric organisms even better nourishment than they normally received in the laboratory incubator. Not wishing to offend our hosts, however, he ate heartily with the rest of us.

It may seem perverse to select commuting and conferencegoing as examples of the need for a thorough reexamination of our relationships with potentially pathogenic microorganisms. Yet these vignettes could be multiplied many times over, showing that the control of infectious diseases is integrated into our thinking far less profoundly than we might imagine.

When we do adopt the type of perspective which Rene Dubos first encouraged, cherished ideas come under threat. Are the world's great cities and megacities, with their centers of commercial and cultural excellence, still to be considered among the pinnacles of human attainment? As Richard Horton has argued in *The Lancet* (**347:**134–51 1996), those attributes have increasingly to be considered alongside evidence that the city and its transportation systems constitute "a dynamo driving infection." Even the large municipal water system, as Mary Wilson points out (*British Medical Journal* **311:** 1681–1684, 1995), has made it possible to infect half a million people with cryptosporidia within a few days.

In a passage in *Mirage of Health* which some today may dismiss as simplistic, but most will see as food for thought, Rene Dubos suggested that effective steps in the prevention of disease in future might be motivated by "an emotional revolt against some of the inadequacies of the modern world, and will result from the search for a formula of life more akin to the natural propensities of man."

This attitude did not mean a retreat from science, however. "Far from it," he wrote. "The crusade for pure air, pure water, pure food was at best a naive and often ineffectual approach to the problems of health of the nineteenth century, but it paved the way for the scientific analysis of the factors responsible for the epidemic climate of the Industrial Revolution. Similarly, scientific medicine will certainly define the factors in the physical environment and the types of behavior which constitute threats to health in modern society."