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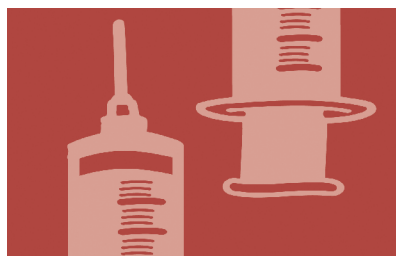
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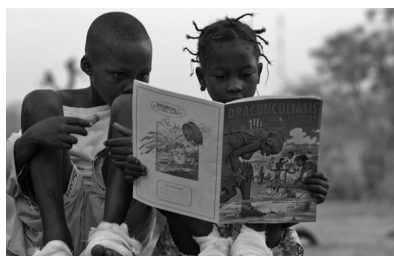
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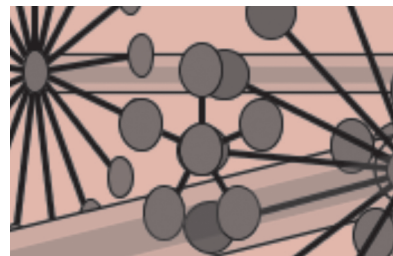
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FROM THE EDITOR

INFECTIOUS DISEASES

They are our daily norms – drinking water, a mosquito bite, *breathing*. All seemingly innocent and unavoidable, but it takes very little to become infected with an infectious disease.

The adage goes, disease respects no borders or socioeconomic status. While that is true to some extent, your address and relative wealth (at least on the global scale) determines, in large part, whether or not you will succumb to one of these diseases. If it didn't, why do so many infectious diseases impact those in low-resource settings?

Let's face it. The neglected tropical diseases The Carter Center is fighting to eradicate would not continue to plague millions if they were rampant in Geneva or New York. Most New Yorkers probably can't define lymphatic filariasis, much less spell it. Indeed, many infectious diseases are mere by-products of impoverished circumstances – lack of clean water, living in refugee camps, etc. Rotavirus, discovered 35 years ago, still plagues many communities. And while recent years have seen a relative boom in funding for neglected diseases, as M Moran et al. show, these resources have, in large part, gone to the "big three" – AIDS, TB and malaria.

But relatively recent collaborative efforts, such as the partnerships fostered by of sanofi pasteur, as well as the network for TB vaccine researchers in Africa, are expediting the progress being made in treating and preventing diseases. Innovative ideas are likewise being implemented in the disease surveillance side of infectious diseases. Rats indigenous to Africa are being used to detect TB. The Internet giant Google is tracking the spread of disease online.

We hope that this issue is a catalyst for discussion offline and at www.globalhealthmagazine.com.

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BY DONALD R. HOPKINS, MD, MPH

The Allure of Eradication



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"YOU HAVE ERASED FROM THE CALENDAR OF HUMAN AFFLICTIONS ONE OF ITS GREATEST. YOURS IS THE COMFORTABLE REFLECTION THAT MANKIND CAN NEVER FORGET THAT YOU HAVE LIVED. FUTURE NATIONS WILL KNOW BY HISTORY ONLY THAT THE LOATHSOME SMALLPOX HAS EXISTED."

Thomas Jefferson to Edward Jenner

U.S. President Thomas Jefferson's message in 1806 to the discoverer of smallpox vaccination articulated the vision and predicted the outcome and consequences of smallpox eradication, but badly misjudged how long it would take for the world to get there. Even before humankind knew what microbes were, the idea of eradicating a disease was already imagined as the Holy Grail of combating human afflictions. More than two centuries later, smallpox has been eradicated for more than 30 years and the desire to eradicate other diseases

is even stronger, but that achievement has not yet been matched for any other disease (campaigns to eradicate Guinea worm disease and polio are underway), although not for lack of trying. It is useful to consider why.

Even before smallpox eradication was finally achieved, separate attempts to eradicate yellow fever, malaria and yaws earlier in the 20th century had already failed. The campaign against yellow fever discovered belatedly that the virus had an inexhaustible reservoir in wild monkeys from which mosquitoes could spread it to people. Hopes for malaria eradication were dashed largely by emergence of resistance to the drug used for treating the parasite and to the insecticide used for killing the mosquitoes that spread the infection to humans. In the case of yaws, a disfiguring and debilitating bacterial affliction that attacks skin and bones, it was realized when the campaign was already underway that for each obviously affected person there were many more infected persons who showed no outward sign of being infected but who could develop sores on the skin and become infectious to others later. It was impossible to stop yaws from spreading without



Dr. Hopkins ©The Carter Center



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detecting and treating all infected persons, whether their infections were evident or not.

When it became clear that smallpox would indeed be eradicated, that impending success spurred a flurry of efforts to identify new disease candidates for eradication. The crescendo of impulsive suggestions became so distracting that the exasperated director general of the World Health Organization (WHO) felt impelled to declare in 1980: "There are many lessons to be drawn from smallpox eradication, but the idea that we should look for other diseases to eradicate is not one of them." Subject to more rigor and experience, the concept of disease eradication has since regained respectability. And although only WHO's governing body, the World Health Assembly, can certify and declare a disease eradicated, for many the impulse to appropriate seductive but inappropriate claims of eradication remain.

The Carter Center established the International Task Force for Disease Eradication (ITFDE), a body of 12 experts (with members from the World Health Organization UNICEF, The World Bank, the Centers for Disease Control and Prevention, universities, a bilateral development agency, etc.) in 1989 to establish criteria and systematically review potential candidates for eradication. The ITFDE's published report in 1993 was followed by major international conferences held in Berlin in 1997 and Atlanta in 1998. The ITFDE and both conferences produced similar, precise definitions of "control," "elimination" and "eradication" as applied

to infectious diseases, in an attempt to promote agreed usage of those terms (Box 1). These efforts have been partly, but not completely successful. (The two words, eradication and elimination, may not even have distinct equivalents in most other languages besides English, French and Spanish.) Crucial to the distinctions in the definitions of eradication, elimination, and control is whether control measures against the disease in question can be halted without the disease re-emerging in a population or not. Eradication and elimination should mean zero cases globally or in a defined geographic area, respectively. The siren call of the hard-won effort to eradicate smallpox still beckons would be eradicators of other afflictions.

After several false starts and some local successes (and despite the embarrassing failure to eradicate malaria, which it only acknowledged belatedly in 1969), the global Smallpox Eradication Program was formally inaugurated by a resolution of the World Health Assembly in 1966. Factors that encouraged the new global campaign to eradicate smallpox were that the often fatal viral disease was easily diagnosed in all who became infected, spread directly from person to person seasonally, induced lifelong immunity in survivors, had no reservoir of infection outside of humans, and was moderately contagious, while there existed a vaccine that was effective, safe, inexpensive, easily administered, and did not require refrigeration.

Two other important characteristics were that several

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and his wife, Rosalynn, in partnership with Emory University, to advance peace and health worldwide. Please visit www.cartercenter.org to learn more about The Carter Center.

INTERNATIONAL TASK FORCE FOR DISEASE ERADICATION'S DEFINITION OF KEY TERMS *

Eradication

Reduction of the worldwide incidence of a disease to zero as a result of deliberate efforts, obviating the necessity for further control measures. True eradication usually entails eliminating the microorganism itself or removing it completely from nature.

Elimination

Refers to cessation of transmission of a disease in a single country, continent, or other limited geographic area, rather than global eradication (e.g., polio in the Americas). It is also theoretically possible to "eliminate" a disease in humans while the microbe remains at large (e.g., neonatal tetanus). Although a disease itself may remain, a particularly undesirable clinical manifestation of it may be prevented entirely (e.g., blindness from trachoma) or new transmission interrupted (e.g., infectious yaws). Control of a disease or its manifestations to a level that it is no longer considered "a public health problem," as an arbitrarily defined qualitative (e.g., onchocerciasis in West Africa) or quantitative (e.g., leprosy incidence below one case per 10,000 population) level of disease control.

Control

Reduced incidence or prevalence of a disease or condition; control measures are still required.

large areas had stopped transmission of the virus already, and that all human beings everywhere were at risk of getting smallpox unless they had already had the disease or been successfully vaccinated. No country was safe from an imported case of smallpox with its attendant deaths, terror and expense until all countries were safe. The last case of naturally occurring smallpox became ill in Somalia on Oct. 26, 1977, after a global expenditure of about \$300 million. The United States, which had its last case of indigenous smallpox in 1949 and contributed about \$32 million to the global campaign, was able to cease routine vaccinations and other expensive defensive measures beginning in 1971, and has subsequently recouped its investment every few weeks, in avoided costs, disease and deaths. The global benefits of smallpox eradication are comparable.

Given the cachet of totally erasing a disease "from the calendar of human afflictions," not to mention the potential consequence, in Jefferson's words, "that mankind can never forget that you have lived," it is little wonder that the concept of disease eradication is so attractive that it has been invoked by all and sundry, often with good intentions but equally often with scant regard for its true meaning. Disease eradication is a powerful tool that properly used, can unleash incredible dedication and effort among health workers and volunteers, generate substantial funding from donors, and attract unusual support for a program by politicians. Health workers and volunteers are motivated by the specific, measurable day-to-day goals, while donors and politicians like the clear and immutable end point. If disease eradication is

permanent and its benefits infinite, why not "go for it" as often as possible? Because eradicating a disease is usually impossible, it is costly, difficult and inherently risky when it is possible, and over-promising devalues the concept.

In 1993, the ITFDE published criteria for assessing the potential eradicability of diseases. The criteria explicitly acknowledge the critical and equally important roles of scientific and political/social factors in considering whether a disease can and should be considered a likely candidate for total eradication. Just as some public health enthusiasts are inclined to ignore or under-value the political/social criteria, political leaders often do not understand or are misinformed about the scientific criteria. A disease such as tetanus that has an inexhaustible reservoir of infective spores in the environment cannot be eradicated, ever. Ditto for African trypanosomiasis (sleeping sickness), with its reservoir in certain wild animals, and most other infections, for various reasons. To the extent that one or more of the above-mentioned scientific and political/social criteria are lacking, the possibility of eradication is impossible or becomes increasingly difficult.

The criteria do not, however, require a prospective disease to "be like smallpox" in order to be considered eradicable (for example, Guinea worm disease is being eradicated mainly with health education despite there being no vaccine). Equally important is the need to recognize the inescapably critical role of the endemic countries themselves, and the fact that some countries

DISEASES IDENTIFIED AS ERADICABLE BY INTERNATIONAL TASK FORCE FOR DISEASE ERADICATION*

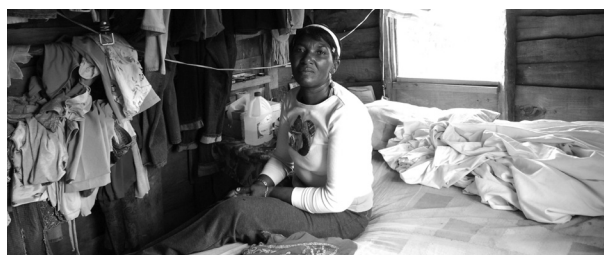
The task force has concluded that seven diseases can be eradicated:

- dracunculiasis
- poliomyelitis
- mumps
- rubella
- lymphatic filariasis
- cysticercosis
- measles

will require and deserve special external assistance, especially if the disease in question is not a major problem for them.

Perhaps the most controversial requirement for success in an eradication program is the unavoidable demand that an eradication program must operate with near-ruthless focus. This has led to endless debates about the relative value of narrow “vertical” eradication approaches in eradication programs as compared to broad-based, primary-care “horizontal” approaches to improving the public’s health, as well as accusations, usually unfounded in my view, that vertical programs have harmed or prevented development of broader health services. In many instances, but for the so-called vertical programs and their ancillary benefits, neglected rural populations would receive little or no health services at all. Ideally, both approaches should be pursued simultaneously, with maximal coordination and synergy, but there is no escaping the fact that to succeed, any eradication program requires obsessive focus, attention to detail, and accountability at all levels to a degree that is not true for a control program.

Unlike control programs, an eradication program must try to achieve near-perfect execution, everywhere the disease occurs, all the time, until transmission is stopped. I like to point out that there is still honor in disease control, even though it is different from disease eradication, that effective disease control is needed, appropriate and possible much more than is disease eradication, and that control programs and primary-care programs would do well to adapt certain aspects of eradication programs, such as measurable interim targets and specific outcome indicators of impact on diseases and conditions. The same advice applies to recent enthusiasms for “integrated disease control” and for



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control of “Neglected Tropical Diseases,” with the caveat that integration and eradication are usually incompatible. Channel the passion directed at “vertical programs” into developing the broad-based public health services and functioning integrated disease surveillance systems that all agree are badly needed and woefully scarce.

After applying the aforementioned criteria, the International Task Force for Disease Eradication concluded in 1993 that six diseases were likely targets for eradication. It has since added measles to that list (Box 2). In its original report, the ITFDE became the first international body to champion the potential global eradicability of lymphatic filariasis, a conclusion that was endorsed implicitly by a resolution of the World Health Assembly in 1997. The World Health Assembly resolution on lymphatic filariasis hedged a bit, however, calling for lymphatic filariasis to be “eliminated” globally “as a public health problem.” The meaning of “a public health problem” in this context was unspecified.

Similar sophistry was and is all too common elsewhere in attempts to garner the perceived potential political and financial benefits of asserting a goal of “eradication” even when eradication, strictly speaking, is not achievable. Apart from current efforts, albeit delayed, to eradicate dracunculiasis (Guinea worm disease) and polio, more recent initiatives to eliminate onchocerciasis from the Americas and to eliminate yaws from Southeast Asia appear to be on track and properly characterized, in my opinion. In addition, since 2006 the ITFDE has promoted the very sensible and long overdue idea that a “program to eliminate both malaria and lymphatic filariasis from the island of Hispaniola is technically feasible, medically desirable and would be economically beneficial to both the Dominican Republic and Haiti.”

In summary, although the term is often abused, sometimes willfully, (disease) eradication is a powerful tool that is only rarely applicable. It should be asserted and used with great care, after much thought, and ideally with broad consensus and endorsement by the World Health Assembly. **GH**