

Disease Eradication



WHO photo by T.S. Satyan
Smallpox eradication campaign

<http://www.historyofvaccines.org/content/articles/disease-eradication>

When a disease stops circulating in a region, it's considered eliminated in that region. Polio, for example, was eliminated in the United States by 1979 after widespread vaccination efforts.

If a particular disease is eliminated worldwide, it's considered *eradicated*. To date, only one infectious disease that affects humans has been eradicated.* In 1980, after decades of efforts by the World Health Organization, the World Health Assembly endorsed a statement declaring smallpox eradicated. Coordinated efforts rid the world of a disease that had once killed up to 35% of its victims and left others scarred or blind.

Smallpox eradication was accomplished with a combination of focused surveillance—quickly identifying new smallpox cases—and ring vaccination. “Ring vaccination” meant that anyone who could have been exposed to a smallpox patient was tracked down and vaccinated as quickly as possible, effectively corralling the disease and preventing its further spread. The last case of wild smallpox occurred in Somalia in 1977.

Smallpox was a good candidate for eradication for several reasons. First, the disease is highly visible: smallpox patients develop a rash that is easily recognized. In addition, the time from exposure to the initial appearance of symptoms is fairly short, so that the disease usually can't spread very far before it's noticed. Workers from the World Health Organization found smallpox patients in outlying areas by displaying pictures of people with the smallpox rash and asking if anyone nearby had a similar rash.

Second, only humans can transmit and catch smallpox. Some diseases have an animal reservoir, meaning they can infect other species besides humans. Yellow fever, for example, infects humans, but can also infect monkeys. If a mosquito capable of spreading yellow fever bites an infected monkey, the mosquito can then give the disease to humans. So even if the entire population of the planet could somehow be vaccinated against yellow fever, its eradication could not be guaranteed. The disease could still be circulating among monkeys, and it could re-emerge if human immunity ever waned. (The discovery of an animal reservoir for yellow fever was in fact what derailed a yellow fever eradication effort in the early

1900s.) Smallpox, however, can infect only humans. In effect, aside from the human population, it has nowhere to hide.

Equally important is the ability to protect individuals against infection. People who survived smallpox naturally developed lifelong immunity against future infection. For everyone else, vaccination was highly effective. WHO trained vaccinators quickly, and they could immunize large groups of people in a short time.

The eradication of smallpox raised hopes that the same could be accomplished for other diseases, with many named as possibilities: polio, mumps, and dracunculiasis (Guinea worm disease), among others. Malaria has also been considered, and its incidence has been reduced drastically in many countries. It presents a challenge to the traditional idea of eradication, however, in that having malaria does not result in lifelong immunity against it (as smallpox and many other diseases do). It is possible to fall ill with malaria many times, although individuals may develop partial immunity after multiple attacks. In addition, although promising steps have been made, no effective malaria vaccine yet exists.

Other diseases present additional challenges. Polio, though it has been reduced or eliminated in many countries through widespread vaccination, still circulates in some areas because (among other reasons) many cases do not present easily recognizable symptoms. As a result, an infected person can remain unnoticed, yet still spread the virus to others. Measles is problematic in a similar way: although the disease results in a highly visible rash, a significant period of time elapses between exposure to the virus and the development of the rash. Patients become contagious before the rash appears, and can spread the virus before anyone realizes they have the disease.

Many people think Guinea worm disease is on the verge of eradication. Only 126 cases were reported in 2014, from only four countries (Chad [13 cases], Ethiopia [3 cases], Mali [40 cases], and South Sudan [70 cases]).^[1] Meanwhile, as of 2008, the Carter Center International Task Force for Disease Eradication has declared six additional diseases as potentially eradicable: lymphatic filariasis (Elephantiasis), polio, measles, mumps, rubella, and pork tapeworm.^[2]

**Rinderpest, a disease that affected livestock, has also been [eradicated](#), largely due to vaccination.*

Sources

1. The Carter Center. [Guinea worm cases left in the world, 2014](#). Accessed 1/13/2015.
2. The Carter Center. [Disease considered as candidates for global eradication by the International Task Force for Disease Eradication](#). (20 KB). Accessed 1/13/2015.

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