



Eradication of Infectious Diseases

Massimo Giangaspero*

Faculty of Veterinary Medicine, University of Teramo, Italy

Abstract

Rinderpest, important disease affecting zootechnics, especially in Africa, was officially declared worldwide eradicated in 2011 by the World Organization for Animal Health (Office International des Épizooties: OIE). This is the first disease of veterinary medicine interest that has been eradicated. To date, smallpox is the only one eradicated infectious disease that affects humans. Measles, genetically related to rinderpest, shows epidemiological characteristics such as no asymptomatic carrier state, no arthropod vector, no known reservoirs outside of humans and availability of vaccines, thus supporting the potential for successful eradication strategies.

Keywords: Eradication; Infectious diseases; Measles; Rinderpest; Smallpox

In veterinary medicine, rinderpest has represented one of the most important diseases affecting zootechnics. The virus was widely distributed throughout Europe, Africa, Asia and West Asia. The epidemic in the 1890s wiped out 80-90 percent of all cattle in sub-Saharan Africa. Between 1889 and 1897, 80-95% mortality was reported also among buffaloes and wild ruminants. An outbreak of rinderpest in imported animals in Belgium in 1920 was the impetus for international cooperation in controlling animal diseases, and a key factor leading to the establishment of the World Organization for Animal Health (Office International des Épizooties: OIE) in 1924. More recently, another rinderpest outbreak that raged across much of Africa in 1982-84 is estimated to have cost at least \$500 million. The severe form of rinderpest was last seen in northern Pakistan in 1994.

Specific characteristics such as no carrier state, no vertical transmission, no arthropod vector, and availability of vaccines were fundamental elements that suggested the possibility to eradicate rinderpest. Surveillance and control measures were widely applied. Eradication campaigns were launched. The most important programme, the Global Rinderpest Eradication Programme (GREP), was supported by the Food and Agriculture Organization (FAO) of the United Nations and OIE. The improved quality of vaccines (including vaccines with improved thermostability) and the development of simple diagnostic kits (agar gel immunodiffusion) resulted in a strong reduction of number of outbreaks and a gradually restricted distribution. In 2007 the Somali ecosystem was the only one region with rinderpest left. In 2010, FAO announced that it was dropping its field surveillance efforts because it felt that eradication had been achieved. Rinderpest was officially declared worldwide eradicated on 25 May 2011 by the World Organization for Animal Health (OIE). The world's first veterinary school was set up in Lyon, France, in 1761 for the control of rinderpest, which means that it took mankind 250 years to eradicate this disease.

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.

Measles is a highly contagious viral illness. The aetiological agent belongs to the genus *Morbillivirus*, closely related to the Rinderpest virus. Evolutionary history investigations suggest a common virus

ancestor evolved in an environment where cattle and humans lived in close proximity, and genetic divergence occurred around the 11th to 12th centuries [1]. Worldwide, measles is a significant cause of morbidity and mortality. In 2000, measles was estimated to cause approximately 31 to 39.9 million illnesses worldwide with an estimated 733,000 to 777,000 deaths, making it the fifth most common cause of death in children under 5 years of age [2]. Control efforts have substantially altered the global distribution. Measles incidence has decreased substantially in regions where vaccination has been instituted, and measles in the developing world has been attributed to low vaccination rates [3,4]. The World Health Assembly adopted the WHO/UNICEF Global Immunization Vision and Strategy, which included a goal of 90 percent reduction in global measles mortality [5]. A further collaborative effort of WHO, UNICEF, the American Red Cross, the United States Centers for Disease Control and Prevention, and the United Nations Foundation launched a new Global Measles and Rubella Strategic Plan which covers the period 2012-2020. The Plan includes new global goals for 2015 and 2020: to reduce global measles deaths by at least 95% compared with 2000 levels, and to achieve measles and rubella elimination in at least five WHO regions. Taking into account that, apart New World and Old World monkeys that may become secondarily infected, humans are the primary reservoir, and there are no other known measles virus reservoirs outside of humans [6], there are no asymptomatic infectious carriers, and safe and efficient vaccines are available, thus supporting the potential for successful eradication strategies, measles might be candidate as the next eradicated infectious disease.

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*Corresponding author: Giangaspero M, Faculty of Veterinary Medicine, University of Teramo, Piazza Aldo Moro 45, 64100 Teramo, Italy, Tel: 33 450 392875; E-mail: giangasp@gmail.com

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