Editorial

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Elimination of neglected tropical diseases is promising

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WHAT ARE NEGLECTED TROPICAL DISEASES (NTDS)

NTDs are a group of disease entities which provoke vicious cycle of poverty and chronic debilitating disease of neglected people in remote areas. The term NTDs itself rebranded “other diseases” within the Millennium Development Goal (MDG) 6, ‘Combat human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS), malaria and other diseases.’¹ In 2005, 13 diseases were listed as a group under name of NTDs focusing on diseases of public health importance in sub-Saharan countries.² Later, World Health Organization (WHO) expanded the list of NTDs to 20 as summarized in **Table 1**.³

Actually, NTDs are diseases of public health importance in tropical areas except for the 3 big tropical diseases (BTDs); HIV/AIDS, tuberculosis, and malaria. Although there are many health issues globally and the issues are various locally, the 3 BTDs and 20 NTDs are selected priority targets for global efforts of systematic approach to control or eliminate.

NTDS IN THE ERA OF MDGS (2000–2015) AND SUSTAINABLE DEVELOPMENT GOALS (2016–2030)

After the declaration of MDGs by the United Nations, WHO, the Bill and Melinda Gates Foundation and other global partners cooperated to achieve the MDG 6. After completion of MDGs during 2000–2015, the United Nations declared the Sustainable Development Goals (SDGs) for the next round of global cooperation during 2016–2030.⁴ The SDGs have 17 goals and the Goal 3 is ‘Good Health and Well-Being.’ The goal 3 target 3.3 is ‘By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.’ The SDGs enlisted ‘NTDs’ as one specific target after the 3 BTDs. During the SDG era, many global public or private partners have enforced financial supports to ongoing MDG programs on NTDs which kept sustainability of the programs. According to long-term sustainable implementation of the MDA programs during the period of MDGs and SDGs, elimination of some NTDs is now certified one by one by member countries.³

Thanks to the global efforts during the MDGs, new HIV infected people were estimated 2.1 million in 2013 compared 3.4 million in 2001, and 12.9 million received antiretroviral therapy. During the period of 2000–2013, malaria incidence and mortality decreased 30% and 47% respectively.¹ Because BTDs had priority during the MDG period, their prevalence, incidence, morbidity, and mortality have been improved greatly.

Elimination of NTDs

Table 1. List of 20 NTDs by WHO and/or global elimination programs

Diseases	Pathogens	Enlisted year	Remarks
Protozoan NTDs			
African trypanosomiasis	<i>Trypanosoma gambiense</i> ^a <i>T. rhodesiense</i> ^b	2005	Sleeping sickness
Visceral leishmaniasis	<i>Leishmania donovani</i>	2005	Kala-azar
Chagas disease	<i>Trypanosoma cruzi</i>	2007	
Helminthic NTDs			
Soil-transmitted helminth infection	<i>Ascaris lumbricoides</i> <i>Trichuris trichiura</i> Hookworms <i>Strongyloides stercoralis</i>	2005	Intestinal helminthiasis
SCH	<i>Schistosoma haematobium</i> <i>S. mansoni</i> , <i>S. guineensis</i> , <i>S. intercalatum</i> , <i>S. mansoni</i> , <i>S. japonicum</i> , and <i>S. mekongi</i>	2005	Bilharzia, urogenital SCH, group 1 biocarcinogen Hepatobiliary SCH
Lymphatic filariasis	<i>Wuchereria bancrofti</i> <i>Brugia malayi</i> , <i>B. timori</i>	2005	Elephantiasis
Onchocerciasis	<i>Onchocerca volvulus</i>	2005	River blindness
Dracunculiasis	<i>Dracunculus medinensis</i>	2005	Guinea worm disease
Echinococcosis	<i>Echinococcus granulosus</i> <i>E. multilocularis</i>	2013	Cystic echinococcosis or hydatidosis Alveolar echinococcosis
Foodborne trematodiasis	<i>Fasciola hepatica</i> <i>F. gigantica</i> <i>Paragonimus</i> spp. <i>Opisthorchis viverrini</i> , <i>O. felinus</i> <i>Clonorchis sinensis</i>	2013	Group 1 biocarcinogen Group 1 biocarcinogen
Taeniasis/cysticercosis	<i>Taenia solium</i>	2013	
Bacterial NTDs			
Buruli ulcer	<i>Mycobacterium ulcerans</i>	2005	
Leprosy	<i>Mycobacterium leprae</i>	2005	Hansen's disease
Trachoma	<i>Chlamydia trachomatis</i>	2005	Trachoma trichiasis
Yaws	<i>Treponema pallidum pertenue</i>	2007	
Viral NTDs			
Rabies	Rabies virus	2007	Zoonosis
Dengue and Chikungunya	Flavivirus	2007	
Other NTDs			
Mycetoma, chromoblastomycosis	Fungi, bacteria	2013	Deep mycosis
Scabies and other ectoparasitosis, tungiasis	<i>Sarcoptes scabiei</i> Ectoparasitic arthropods <i>Tunga penetrans</i>	2017	Mange mite Sand flea
Snakebite envenoming	Venom of 12 snakes	2017	Venom intoxication

Summarized from neglected tropical diseases by WHO at https://www.who.int/neglected_diseases/diseases/en/.

NTD = neglected tropical disease; WHO = World Health Organization; SCH = schistosomiasis.

^aAlso named as *Trypanosoma brucei gambiense*; ^b*T. brucei rhodesiense*.

Also, the disease incidence of NTDs decreased much during the MDG era by global elimination programs but the decrease varied by areas and diseases. Human African trypanosomiasis was reported 300,000 new cases a year in 1995 but the reported cases dropped to 9,878 in 2009 and 977 in 2018.³ Especially, NTDs which are targets of mass drug administration (MDA) have been decreased significantly during the MDG period. The target NTDs of global MDA are soil-transmitted helminthiasis (STHs), schistosomiasis, lymphatic filariasis (LF), onchocerciasis, and trachoma. The MDA began during the MDGs and went through the period of SDGs. For example, LF was one of major targets of global MDA in 73 endemic countries, and 18 countries completed intervention and validation. In 2018, a total of 465 million people was medicated by combined triple medication of diethylcarbamazine, albendazole, and ivermectin. The MDA for LF has been sustainable in most endemic areas over the world with about 75% coverage annually for 5 years and repeated one more round of 5 years after assessment. The MDA for LF is ongoing in 45 countries. Albendazole of

the triple medication targets STHs and ivermectin targets onchocerciasis simultaneously. Another big MDA target is schistosomiasis which is usually co-implemented with STHs. School-aged children in all African endemic areas are medicated with praziquantel and albendazole/mebendazole for several years. In 2017, 99 million were treated for schistosomiasis (68% coverage in Africa) and 598 million for STHs (69% coverage).³ The MDA is the most cost-effective way of control or elimination of NTDs when the coverage is over 80%. Sustainable and high coverage MDA may eliminate NTDs by reducing reproductivity of the target parasites in the near future. **Table 2** summarizes recent status of the diseases and efforts of elimination.

Table 2. Prevalence, disease burdens, and elimination programs of NTDs

Diseases	No. endemic countries	Prevalence/deaths	Vector/reservoir	Drugs	Elimination programs
Protozoan NTDs					
African trypanosomiasis	Tg 24, Tr 17 African countries	977 (2018)	Tsetse flies	Fexinidazole	National Sleeping Sickness Program
Visceral leishmaniasis	VL 7, CL 9 countries	VL 22,145 (2017)	Sand flies	Liposomal amphotericin B (AmBisome®)	AmBisome donation by Gilead Sciences
Chagas disease	21 American countries	6 million infected, 30,000 patients/yr, 12,000 deaths/yr	Kissing bugs	Benznidazole, nifurtimox	World Chagas Disease Day 14 April
Helminthic NTDs					
Soil-transmitted helminth infection ^a	> 100 countries	> 120 million	Soil, water contamination	Albendazole, mebendazole	Global Elimination Program with LF
Schistosomiasis ^a	Sub-Saharan Africa, Mekong delta, Philippines	240 million, 0.2 million deaths/yr	Snails	Praziquantel, 40 mg/kg MDA	Schistosomiasis Control Initiative, praziquantel donation by Merck
LF ^a	35 African, 9 Asian countries	120 million infected globally, 2.8 million DALYs	Mosquitoes	Diethylcarbamazine, albendazole, ivermectin	Global Elimination Program with LF
Onchocerciasis (Oncho) ^a	31 African, Brazil, Venezuela	100 million treated/yr	Black flies	Ivermectin 1/yr for 10–15 yr	Onchocerciasis Control Program, Mectizan Donation Program by Merck & Co., African Program for Oncho Control, Oncho Elimination Program for the Americas
Dracunculiasis	3 African countries (2018)	28 (2018)	Cyclops/dog, cat, baboon	No drugs	The Carter Center
Echinococcosis	Europe, Asia, Africa		Carnivores	Albendazole	
Foodborne trematodiasis	Fascioliasis in 75 countries	2.4 million	Watercress/cattle	Diclabendazole	Donation by Novartis Pharma AG
	Paragonimiasis		Crustacea/carnivores	Praziquantel	
	Clonorchiasis in East Asia	15 million	Freshwater fish/mammals	Praziquantel	
		6 million	Freshwater fish/mammals	Praziquantel	
	Opisthorchiasis in Indochina, Mid-Asia			Praziquantel	
Taeniasis/cysticercosis	Worldwide	1.5 million NCC, 2.8 million DALYs (2015)	Pigs, fecal contamination	Praziquantel	
Bacterial NTDs					
Buruli ulcer	33 Africa, Asia, America	2,713 (2018)		Rifampicin	Global Buruli Ulcer Initiative
Leprosy	14	176,176 new cases (2015)		Clarithromycin	Global Leprosy Strategy 2016–2020
Trachoma ^a	Africa, Asia, Middle East, South America	TT 0%–2%, 8 countries eliminated	Flies	Azithromycin	International Coalition for Trachoma Control, International Trachoma Initiative
Yaws	14, Africa, Asia	> 30,000/yr		Azithromycin	
Viral NTDs					
Rabies	150, Africa & Asian countries, 89 countries of deaths	59,000 deaths/yr	Dogbites		United Against Rabies: Zero by 30, World Rabies Day: 28 September
Dengue and Chikungunya	Asia (75%), Latin America, Africa	100 million/yr	Mosquitoes		Dengue Control Initiative

(continued to the next page)

Table 2. (Continued) Prevalence, disease burdens, and elimination programs of NTDs

Diseases	No. endemic countries	Prevalence/deaths	Vector/reservoir	Drugs	Elimination programs
Other NTDs					
Mycetoma, chromoblastomycosis	Tropical Africa, Latin America, Middle East		Thorn pricks, soil contamination	Antifungals, antibiotics	
Scabies and ectoparasites	Worldwide	200 million, 0.2%–71% by reports	Human contact	Ivermectin (300 µg/kg, repeat after 1 week), 5% permethrin	International Alliance for the Control of Scabies
Tungiasis			Soil/animals	Surgical extraction, two component dimeticone	
Snakebite envenoming	Worldwide	5 million bitten/yr, 2 million clinical cases/yr, ~130,000 deaths/yr			

NTD = neglected tropical disease; Tg = *Trypanosoma gambiense* (*Trypanosoma brucei gambiense*), Tr = *Trypanosoma rhodesiense* (*Trypanosoma brucei rhodesiense*), VL = visceral leishmaniasis, CL = cutaneous leishmaniasis; LF = lymphatic filariasis; DALY = disability-adjusted life year; TT = trachoma trichiasis; NCC = neurocysticercosis.

*Target NTDs of mass drug administration.

The achievements by global continuing efforts during the MDG and SDG era have convinced all stakeholders that elimination is achievable for both BTDs and NTDs. In many past endemic areas, new cases of African trypanosomiasis, dracunculiasis, onchocerciasis and trachoma have decreased significantly. It is promising to eliminate them in the near future, and dracunculiasis may be the first.

THE WORLD NTD DAY AND GLOBAL PARTNERS

To enforce active control or elimination activities on NTDs, the World NTD Day was proposed ‘30 January 2020’ under slogan “Beat NTDs: For good. For all.” by 350 global partners.⁵ The website of the World NTD Day explains background, why the date 30 January 2020, toolkits, and global actions. The date 30 January was anniversary of the 2012 London Declaration on NTDs which was endorsed by global public and private partners.⁶ The global partners gathered at London and agreed to sustain MDA to help eradicate dracunculiasis (Guinea worm disease), to help eliminate by 2020 LF, leprosy, sleeping sickness, and blinding trachoma, and to help control by 2020 schistosomiasis, STHs, Chagas disease, visceral leishmaniasis and onchocerciasis. The London Declaration was looking ambitious and greatly encouraged NTD workers. Main partners of the London meeting were global pharmaceuticals whose continuous donation of drugs has kept global MDA for NTDs sustainable.

CONCLUSION

The 2020 is the launching time of new goals and roadmaps of NTDs until 2030.⁷ There are many global contributors such as funders, sponsors, donors, and health workers. Their contributions must be sustainable and coordinated by supporting finance, drugs, diagnostics, techniques, and efforts.⁸ Those global supports help bottom billion NTD victims overcome self-neglect.⁹ Elimination of NTDs is promising because NTDs are less and less neglected by global partners.

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