

TESTIMONY

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“The Growing Threat of Cholera and Other Diseases in the Middle East”

**Subcommittee on Africa, Global Health, Global Human Rights, and International
Organizations
Committee on Foreign Affairs
United States House of Representatives**

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Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to speak with you today. I am Peter Hotez, a biomedical scientist and pediatrician. I am the dean of the National School of Tropical Medicine at Baylor College of Medicine and also the Texas Children's Hospital Endowed Chair in Tropical Pediatrics based at the Texas Medical Center in Houston. I am also past president of the American Society of Tropical Medicine and Hygiene, and currently serve as President of the Sabin Vaccine Institute, a non-profit which develops vaccines for neglected tropical diseases (NTDs) through a product development partnership (PDP) model. This year I am also serving as US Science Envoy for the State Department and White House Office of Science and Technology Policy focusing on the urgency to develop vaccines for diseases that are emerging in the Middle East and North Africa due to the breakdowns in health systems in the ISIS occupied conflict zones in Syria, Iraq, Libya, and also Yemen.

In my submitted written testimony I highlighted some of the successes in US global health policy, many of which can be attributed to the hard work of this Subcommittee working hand in glove with two presidential administrations since 2000. I cite evidence from the Global Burden of Disease Study (GBD) that brings together hundreds of scientists - I am also a part of this - who are measuring the impact of large scale global health programs. In a series of 2015 papers we published in the journal *The Lancet*, the GBD found that over the last 15 years (since the launch of the Millennium Development Goals) we have achieved great gains in HIV/AIDS, malaria, tuberculosis, and neglected tropical diseases (NTDs) through US Government led programs: PEPFAR, PMI, USAID NTD. The bottom line is impressive: A 30% reduction in the number of malaria cases and in the number of malaria deaths, approximately 300,000-400,000 lives saved annually; turning the corner on HIV/AIDS cases and deaths, especially in Africa, with an estimated 19 million lives saved and a significant decrease in the number of deaths. Third, we have cut the number of cases of three NTDs by 30-40% - lymphatic filariasis (LF, elephantiasis), onchocerciasis (river blindness), and blinding trachoma. And we can see the elimination of LF, river blindness and trachoma in the coming decade! We are particularly eager to see the US annual commitment for NTDs reach at least \$125 million to achieve projected NTD goals and maximize the generous drug donations from leading pharmaceutical companies. To date, almost 500 million people have received over one billion treatments making this program one of the largest and most cost effective in all of global public health!

That's the good news, but I also have some not-so-good news. Like peeling the layers of the onion the great successes of USG-led initiatives have created some new interesting trends and observations in global health. One of them is the subject of my forthcoming book that will be published by Johns Hopkins University Press revealing a hidden burden of neglected diseases in wealthy countries, including the United States. I found that most of the world's NTDs are now paradoxically found in the wealthy group of 20 (G20) nations, together with Nigeria. The extreme poor who live amidst the wealthy in these nations today account for one-half the world's intestinal worm infections, and most of the dengue and other arboviruses, leishmaniasis, Chagas disease, TB, and other NTDs. I believe that this is an important observation, because while USG programs should continue for the poorest countries, we could eliminate at least one-half of the

world's neglected diseases if the leaders of the G20 countries would commit to taking on these diseases within their own populations.

I would like to go through two specific examples:

1. The Middle East and the countries surrounding the Mediterranean – North Africa and Southern Europe
2. Zika virus infection in the Americas and the vulnerability of our US Gulf Coast

And then briefly end on what we should be considering as a next step.

MENA and Southern Europe

In my role as US Science Envoy for the Middle East and North Africa it is becoming clear that the factors that promoted the emergence of Ebola in West Africa in 2014 are now present in the ISIS occupied areas of Iraq and Syria, Libya, and to some extent Yemen. It won't be Ebola but neglected diseases that are equally destructive. Let me explain – Ebola spread across Guinea Liberia and Sierra Leone not because it was tropical but because years or decades of atrocities has decimated their health systems and healthcare infrastructure, this combined with deforestation and human migrations created the perfect storm that allowed Ebola virus to flourish. Based on reports from the area and the diseases among refugees in neighboring Turkey, Lebanon, and Jordan, these same forces are in play in the Daesh occupied areas. We have already seen that polio and measles re-emerge, and we are now seeing a massive surge, more than 100,000 cases of a highly disfiguring parasitic disease known as leishmaniasis, which the locals call “Aleppo evil”. It's transmitted by sandflies that thrive in the uncollected garbage of Aleppo and other urban and suburban areas of the Syria, Iraq, and Libya. The disease causes horrific ulcers that can appear on the face and disfigure people, especially girls and women and leave them with permanent scars that render them unmarriageable. There is a medicine that is administered by injection of an antimony containing compound into the lesion, but there is an access problem in the affected areas, and the bottom line is we need a vaccine. I will come back to that. We're also seeing the emergence of dengue and other arbovirus infections, and scabies, as well as malaria, tuberculosis, schistosomiasis, hepatitis A and B, and classical childhood viral infections such as measles and polio. Also of great concern is the emergence of zoonotic infections linked to animal trafficking across fractured international borders, such as brucellosis. As another example, Middle Eastern Respiratory Syndrome (MERS)—recently appearing in Saudi Arabia and elsewhere on the Arabian Peninsula—could spread undetected through camel animal reservoirs. Still another factor promoting the spread of diseases into the Middle East is the Hajj, the annual pilgrimage to Mecca. The Hajj is believed to be responsible for the introduction of dengue into Saudi Arabia and there are concerns that Zika will soon spread to Saudi Arabia as well.

In an additional study we found that these neglected diseases are now having a huge adverse economic impact on the member states of the Organisation of Islamic Cooperation, the world's Muslim countries and we're in discussions with the Islamic Development Bank about having a

greater role in disease prevention and vaccine development. With the exception of Indonesia there is almost no capacity for developing new vaccines in any Muslim country and zero capacity in the Middle East.

An interesting observation is that we may be seeing spillover of this situation into Southern Europe. Within the last three years we have seen the re-emergence of malaria in Greece after an absence of more than 50 years, dengue in Portugal, WNV and chikungunya in Spain and Italy, and schistosomiasis in Corsica. What's responsible, is it coming from across the Mediterranean from North Africa or from the Middle East? Is it climate change? The economic downturns in Southern European countries? Some combination?

Zika

And we're seeing a somewhat similar emergence of neglected tropical diseases – NTDs - in the Western Hemisphere. Chikungunya virus infection, an arbovirus infection transmitted by Aedes mosquitoes, entered the New World in December of 2013 on the Caribbean Island of Saint Martin and in the course of a year spread across the Latin American and Caribbean region with alarming speed. Now Zika virus, also transmitted by Aedes mosquitoes, has come across the Pacific, entered into Latin America via Easter Island off the coast of Chile and spread quickly throughout Brazil last year, with more than 1 million cases, and then Colombia South America with 700,000 cases. Some of the reasons for the rapid spread are under investigation but include mutations in genes encoding the NS1 and NS4 virus genes that facilitate virus replication.

The epidemic of Brazil's Zika epidemic is Pernambuco State, one of the Brazil's poorest states where other neglected tropical diseases are found, including elephantiasis and schistosomiasis. Again poverty is the most powerful driver, affecting mostly women who live in extreme poverty. Since poverty is a risk factor because of poor housing, absent window screens, and environmental degradation in the neighborhood

Zika appears to be unique among arboviruses in that when it infects a woman early in her pregnancy the virus not only enters her bloodstream but can be passed to her unborn baby to cause a horrific congenital birth defect known as microcephaly – small head 2-3 standard deviations below normal head circumference, together with an abnormally formed brain due to the invasion of the virus in the baby's central nervous system. So far there have been 4,000 cases of microcephaly, most in northeastern Brazil, and these children are expected to exhibit profound mental disabilities, or even be neurodevastated. The virus is also causing stillbirths.

The virus is spreading rapidly, now in five Caribbean countries and on Puerto Rico. we can expect that Haiti could get hit the hardest where it could infect up to a quarter of a million pregnant women who live in a country with no real health system – such that tens of thousands of babies could be borne with microcephaly, but even PR and the US Virgin Islands are highly vulnerable.

Gulf Coast

Could Zika hit the Gulf Coast of the U.S.? In coastal Texas, Florida and most places in between we have two different species of mosquitoes that can transmit Zika. Together with extreme poverty in places such as Houston's Fifth Ward and elsewhere, at our National School of Tropical Medicine at Baylor, together with Texas Children's Hospital we're already getting ready for the possibility of maternal infections and birth defects in our city.

The U.S. has poverty. In the United States I estimate that we currently have 12 million people living with at least one neglected tropical disease including Chagas disease, cysticercosis, toxocariasis, trichomoniasis, and toxoplasmosis. Like NTDs abroad, these chronic and debilitating infections contribute to poverty in the U.S. by impairing childhood cognition, making people too sick to go to work, and affecting pregnancy outcome. In a paper last year in *JAMA Psychiatry*, I wrote how some of these diseases may actually contribute to the achievement gap noted among socioeconomically disadvantaged children in our country. Pending legislation such as H.R. 1797, the End Neglected Tropical Disease Act, which passed out of the House Foreign Affairs Committee on January 7th, and H.R. 2897, the Neglected Infections of Impoverished Americans Act, could go a long way towards tackling these diseases, just as we have done in Texas by passing House Bill 2055 to begin surveillance for our neglected diseases.

New models for innovation: Supporting the PDPs

It sure would be nice to have vaccines for Aleppo evil, schistosomiasis and Zika. We urgently need to find a better way to develop innovations for neglected diseases, including NTDs. We saw how in 2014-15 the Ebola vaccine was not available to prevent the deaths of 11,000 people even though the technology to develop such a vaccine was published in the biomedical literature a decade previously. This is because the entire system relies almost exclusively on having the multinational pharmaceutical companies take an interest in developing vaccines, even if they are not financially remunerative. Once again in 2016 we will need vaccines to fight the following categories of neglected diseases and NTDs and it is not clear if industry will have an interest in developing these technologies:

To ensure these vaccines get developed, I believe that we will need to incentivize organizations known as product development partnerships (PDPs). PDPs are non-profit organizations that were established to develop and test products for NTDs, TB, malaria, and other neglected diseases. There are approximately 16-20 PDPs globally, including several that are developing vaccines. Our Sabin Vaccine Institute PDP in Houston, Texas, for example has a pipeline of six vaccines for NTDs.

Unlike the EU, and governments of Japan and several European countries, the USG does not specifically fund initiatives that support the PDPs. The SBIR mechanism fosters innovations among small businesses, but because PDPs are non-profit organizations they are not eligible for SBIR support. Similarly, the priority review voucher (PRV) system does not allow vaccine PDPs to obtain PRV funds until they license a vaccine, which is a very high and lengthy

window. One idea would be to allow vaccine PDPs to be eligible for PRVs by reaching milestones short of licensure such as completing phase 1 or 2 clinical trials. In a Public Library of Science article, I estimated that setting aside just 1-2% of the USG budget for global health initiatives for PDPs could provide sufficient finances for the PDPs to develop a new generation of antipoverty drugs, diagnostics, and vaccines. As there is no commercial incentive to develop new tools that mostly or exclusively affect the world's poor, there is an urgent need for increased public investment into NTD R&D in order to sustain momentum for the development of new health tools, advance products currently in development and deliver them to people in need worldwide. We urgently need to open windows that allow PDPs to gain financial support.

Mr. Chairman, this concludes my statement and I now look to answering any questions you or the Subcommittee may have.