

The Global Virome Project (GVP)

Making the 21st century safe from emerging viral threats

The Challenge

Over the course of human history, less than 0.1% of all viruses with the potential to pose a threat to global health and security are estimated to have spilled over from their animal reservoirs into human populations. Since the middle of the 20th century, however, a stream of new and deadly disease threats has steadily emerged, highlighting that the threat from this vast pool of “unknown” viruses is accelerating exponentially. This acceleration is projected to continue throughout the course of the 21st century, driven by our expanding population and global travel. Our responses to the SARS, pandemic influenza, MERS, Ebola and Zika outbreaks illustrate that the world is ill-prepared to either mitigate the impact of these emerging viral threats or to prevent their emergence – leaving the world supremely vulnerable to their consequences.

“Know the Enemy”

The revision of the International Health Regulations in 2005, the expanding role of the One Health movement, and recent efforts by the Global Health Security Agenda have all contributed towards building systems and capacities for “preventing, detecting and responding” to emerging infectious disease threats. However, these efforts are constrained by an unresolved debate between the use of reactive measures to reduce the impact of diseases after they have emerged and the more forward-leaning development of countermeasures before a declared emergency. This “reactive” toolkit – largely vaccine and therapeutics – is often undercut by the speed at which viruses spread across our globalized planet. Likewise, our ability to prepare countermeasures in advance and to mitigate the emergence of new threats is undermined by a lack of knowledge about novel viral threats, their ecology and their drivers, including human behaviors, which propels pandemic emergence. To be fully prepared we need to “**know the enemy**” before it emerges.

A Seminal “Proof of Concept”

USAID’s Emerging Pandemic Threats/PREDICT project has demonstrated that, with existing technologies, it is feasible to mount a global venture to discover and characterize new viruses from high-risk wildlife reservoir hosts. On the basis of this work, PREDICT has estimated that there are over 1.3 million unknown viral species in mammalian and avian populations and that an estimated 500,000 of these have the potential to infect humans (see Fig. 1) and cause disease. The total cost to “knowing the enemy” – to discover and characterize more than 99% of this “global virome” is \$3-5 billion over 10 years.

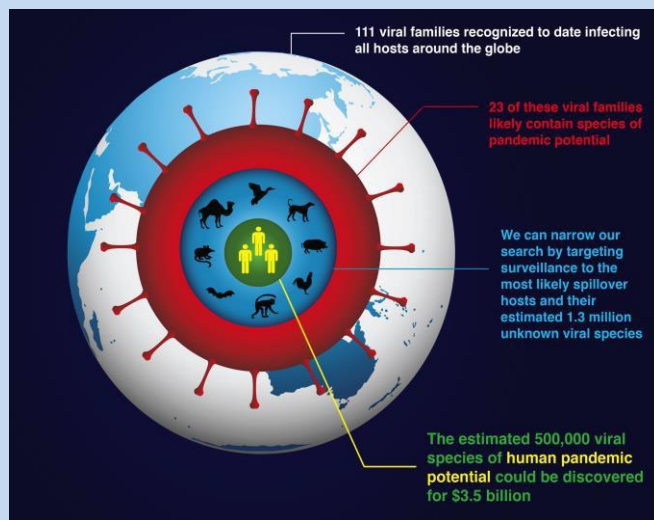
The GVP Is Transformative

The GVP is envisioned as a groundbreaking global partnership to detect and characterize virtually all of the planet’s unknown viral threats circulating in animals (Fig. 2) and trigger:

A different way of thinking: The GVP builds on the PREDICT proof of concept and exploits advances in science and technologies to pivot our global culture from one that is reactive to one that is proactive.

A new way of investing: Equally importantly, the GVP challenges the global community to use this knowledge to proactively develop preventive and preparedness measures, such as vaccines and novel therapies, before spillover into human populations occurs.

Figure 1:
Estimated number of “unknown” zoonotic viruses



In press

The Approach

The GVP is committed to achieving these results through core principles that:

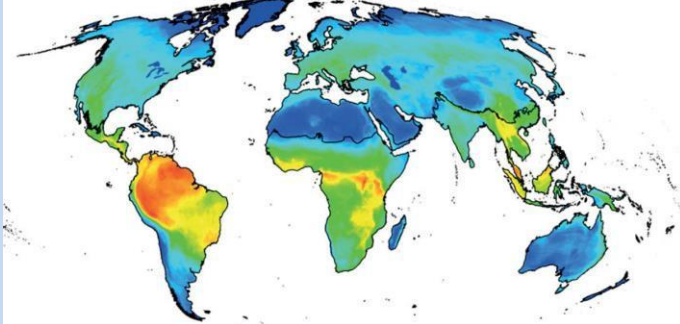
- Embrace an international scope, while fostering local ownership
- Promote equitable access to data and benefits
- Foster transparency
- Build national capabilities for prevention, detection and response for emerging viral threats in all partner countries on an unprecedented scale
- Foster global ownership through an international alliance

It is said if you know your enemies and know yourself, you will not be imperiled in a hundred battles; if you do not know your enemies but do know yourself, you will win one and lose one; if you do not know your enemies nor yourself, you will be imperiled in every single battle.

Sun Tzu

Figure 2: Likely “Hot Spots” for Viral Diversity

Viral diversity is closely related to mammalian diversity, allowing for geographic targeting



Mammalian Diversity Map: C. Rondinini et al. Phil. Trans. Roy. Soc. B. 2012

Anticipated Benefits of the GVP

By detecting & characterizing, within 10 years, 99% of all unknown zoonotic viral threats from wildlife and livestock hosts with the potential to spillover into people and the food supply, the GVP will:

- Characterize the geographic scope and host range of the viruses (reservoirs and transmission hosts)
- Identify behaviors and practices that potentiate spillover, allowing for the targeting of risk mitigation measures
- Monitor the movement of viruses across hosts and regions
- Establish a global surveillance network through local and global capacity enhancements (e.g. surveillance, field biology, lab proficiencies, biosafety)
- Establish sample biobank(s) for further research and an open-access database that includes sequence and metadata
- Make data and samples available for public health risk assessments and mitigation, as well as further detailed pathogen studies
- Identify transmission and pathogenicity markers for high-risk viruses
- Establish a legal, regulatory and ethical framework for sample, data, information and benefit sharing
- Lay the foundation for the long-term sentinel monitoring of a viral “watch list” based on virologic characteristics, as well as behavioral, epidemiologic and ecologic circumstances

GVP: Making the World Safer and More Secure

The knowledge base generated by the GVP, coupled with the emergence of a more proactive approach towards preparedness, will create unprecedented opportunities to make the world more safe and secure from future viral threats by enabling:

- *Bioinformatics that will foster new strategies for the development of vaccines, pharmaceuticals and potentially other new classes of countermeasures in advance of future pandemic and epidemic events*
- *Strengthening of global & local capacities to monitor for and respond to viral threats while they are still evolving in animal populations to enable improved prevention of spillover*

A GVP “Halo” Effect

The launch of the Human Genome Project in the late 1980s catalyzed the development of new technologies which dramatically shortened the time and cost required for its completion and ushered in the era of personalized genomics. It is estimated that every U.S. federal dollar put into the Human Genome Project resulted in a \$178 return on investment. The launch of the Global Virome Project is expected to yield similar benefits by accelerating the development of new diagnostics, vaccine technologies and risk mitigation strategies, all of potentially higher return, given their more direct relevance to human health and the high costs of emerging viral diseases. Like the Human Genome Project, this initiative will provide a wealth of publicly accessible unbiased data, leading to advances in both science and global health that are currently hard to anticipate, such as the discovery of unknown viruses that cause cancers and chronic physiological, mental health or behavioral disorders.

**For more information contact:
www.globalviromeproject.org**

The Global Virome Project marks the beginning of the end of the Pandemic Era