WHO-UN-EU-National Governments

Research agencies, CDCs

Philanthropic organizations-Global Civil Society Organizations
Industry, Non Governmental Organizations (NGOs)

Surveillance (Networks)
WHO (GOARN)
CDCs

Independent Science Solution Technology

Development & Dissemination
CEPI
GAVI
DNDI
Multilateral development banks

On site capacities, infrastructures
International Network of Pasteur Institutes, Fondation Merieux
CDCs,
Clinical Research and management : EDCTP etc..

VIRUS EMERGES

Problem (Virus Impact)

Answer (Cause, Mechanism, Solution)

Implementation (Vaccine, Diagnostics, treatments Developed & Disseminated)

Development & Dissemination
Which are the needs?

- Science-driven actions and translation to global health of the progress of science: The best of science
- Translation to field activities and real life: reinforcing (not replacing) organizations with on site capacities
- Coordination of the various networks and organizations efforts
- Global: « Really Global »
- Preparedness for the next epidemics: Watch, reactivity, task force-organization
- Education, training, talent recognition and development: human resources
The Global Virus Network

Robert Gallo (Baltimore) (Middle)
William Hall (Dublin) (Right)
The late Reinhard Kurth (Berlin), (Left)

2011
WHO-UN-EU-National Governments

Research agencies, CDCs

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VIRUS EMERGES

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Vaccines Treatments

Diagnostic Epidemiology Treatments

On site capacities, infrastructures
International Network of Pasteur Institutes, Fondation Merieux
CDCs,
Clinical Research and management : EDCTP etc..
The Global Virus Network

- Research
- Independent and reactive Expertize
- Task forces on specific viruses
- Education and training

Interactions and Collaborations

A Global strategy

A Global and One Health approach
GLOBAL VIRUS NETWORK
Centers of Excellence and Affiliates

Map of Centers of Excellence and Affiliated Institutions
GVN Center ‘Twinning’
Hokkaido U. (HU) -- U. College Dublin – UCD – Zambia
Institute of Human Virology Baltimore- IHV Nigeria

Institutions involved in the GVN Center ‘Twinning’ project are located in Hokkaido, Japan, and Zambia, with additional collaborations in the USA and Ireland.
GVN•Institut Pasteur•Merieux Foundation Sites in Africa and South East Asia

GVN

Nigeria
South Africa
Zambia
Vietnam

Institut Pasteur

Algeria
Cameroon
CAR
Guinea
Ivory Coast
Madagascar
Morocco
Niger
Senegal
Tunisia

Cambodia
Laos
Vietnam

Fondation Merieux

Benin
Burkina Faso
Guinea
Madagascar
Mali
Niger
Senegal
Togo

Cambodia
Laos

RESAOLAB Network

GABRIEL Network
Regional GVN

- European GVN, North America GVN
- Africa GVN
- South East Asia GVN;
- South America;
- Caraibbean
- Chinese GVN
- Others ?
1. Provide the world’s 1st Pre-Staged Teams of Virus Experts, by Class

- Already, GVN can provide access to this resource in an epidemic

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<tr>
<th>Countries</th>
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<tr>
<td>Argentina</td>
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<td>The Pirbright Institute Pirbright</td>
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<td>J. Craig Venter Institute</td>
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<td>Univ. of Rochester Medical Center, School of Medicine and Dentistry</td>
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<td>University Texas Medical Branch, UTMB, Galveston</td>
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<td>Center for Global Health (CGH), University of Michigan</td>
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<td>University of Pittsburgh Cancer Institute</td>
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<td>Tulane University School of Medicine</td>
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<td>Vietnam</td>
<td>Vietnamese NIHE, Laboratory of Molecular Diagnostics</td>
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THE GLOBAL VIRUS NETWORK

CONFRONTING EMERGING VIRAL THREATS

- Top level science: Research
  Joint research programs
  Education, training
  Support to young investigators

- Best Scientific and Reactive Expertize for national and international organizations

- Watch, Reactivity, Task force based organization
  Confronting epidemics

- Support to networks and organizations with on site capacities and infrastructures:
  Training
  Research programs
GVN International Meetings

2011 | Washington DC, USA
    | Dublin, Ireland
2012 | Naples, Italy
    | Baltimore, USA
2013 | Munich, Germany
    | Moscow, Russia
2015 | Beijing, China
2016 | Sapporo, Japan
2017 | Melbourne, Australia
2018 | Annecy, France
2019 | Barcelona, Spain

The 9th International
GLOBAL VIRUS NETWORK MEETING

Melbourne, 25 - 27 September 2017

Pandemic, Epidemic and Emerging Viruses in the Asia Pacific Region

Visit the conference website at: [http://gvn.org](http://gvn.org)
GVN Tasks Forces
The Global Virus Network Zika Task Force leadership has prepared a short, electronic survey of Zika and flavivirus research taking place at several institutions.

The survey identified the need of serum samples from definitely diagnosed patients to use for:

- Development of sensitive and specific diagnostics for ZIKV
- To better evaluate and compare immune responses to ZIKV infection and for vaccine candidates.

GVN Zika Serum Bank

- Established by a generous gift from Allergan to the GVN to assist with the development of diagnostics and vaccines
- Acute and convalescent (and several paired) patient sera donated and redistributed through the World Reference Center for Emerging Viruses and Arboviruses at UTMB
- Currently ca. 130 sera available in various volumes from 0.1-1.0+ mL, most aliquoted and lyophilized for ease of shipment
- Depending on volumes received, various validation testing performed:
  - PRNT (ZIKV and DENV-1-4)
  - ZIKV MAC-ELISA
  - ZIKV RT-PCR
  - CHIKV and DENV IgM
  - ZIKV and DENV NS1
Locations of Donor Exposure

- Dominican Republic
- Honduras
- Various Caribbean Islands
- Columbia
- El Salvador
- Guatemala
- Haiti
- Mexico
GVN Zika Serum Bank Request Form

The Global Virus Network is an independent, non-profit organization that was founded in 2011 in Washington, D.C. Today, the GVN is comprised of 38 Centers and 6 Affiliates in 24 nations. The GVN vision is: “A world prepared to prevent, contain and control viral epidemic threats, through the collaboration of a global network of expert virus laboratories.” That vision is approached by: (1) Establishing a global network of expert virology laboratories; (2) Promoting the development of new tools, including diagnostics, antiviral drugs and vaccines; (3) Training the next generation of virologists; and, (4) Advocating for a more comprehensive and inclusive response to viral threats worldwide. For more information, visit www.gvn.org.

To assist with the development of diagnostics and vaccines and to better understand the humoral immune response to Zika virus infection, the GVN, thanks to a generous gift from Allergan, has established a patient serum bank. The donated sera or plasma, provided without patient identification, will be distributed to scientists with a clear need through the World Reference Center for Emerging Viruses and Arboviruses (WRCEVA) at UTMB. The GVN Zika Serum Bank has both acute, PCR-positive and convalescent, antibody-positive sera.

Requests will be reviewed to determine the best use of these limited Zika-positive human serum/plasma samples.
The importance of surveillance and alert networks

Example: The Global Outbreak Alert and Response Network: GOARN, WHO:

- Assist countries in their efforts to fight against diseases, by providing an appropriate technical support to populations in a timely manner
- Investigate and characterize sanitary events and analyze the risks of a rapidly-emerging threat
- Support the national authorities’ efforts to prepare for sanitary crises
HTLV Task Force


2017. “Time to go back to the original name,” Frontiers in Microbiology.
GVN Chikungunya Task Force

- Consortium of centers:
  South East Asia-Africa-South America
  Twinned with US-EU-China

- Combining:
  Survey and epidemiological research
  Research on circulating arboviruses and analysis of genetic variability
  Assessment of vaccine efficacy
  Serum biobank

- Contribute to Preparedness: Exercise in anticipating future spreading and impact of genetic variability
Predicting emergence events, host jumps, strain displacement

Marco Vignuzzi

most viral outbreaks are caused by RNA virus which infect hosts as swarms of mutants over years/decades some mutants emerge and replace the contemporary ‘wildtype’

Chikungunya

The Holy Grail:
Is evolution predictable?
Longterm – unlikely; but short term – more likely

The evidence:
We can recreate epidemic emergence in the lab, and observe converging evolution across experiments/conditions

The challenge:
Generating genotype-phenotype maps to outline the evolutionary trajectories most accessible to current strains
Our approach: use maths and experimental evolution to generate genotype to phenotype fitness landscapes to monitor evolution and predict the next mutations to emerge.

Viruses of interest:
close relatives of previous epidemic viruses (same viral family), with occasional spillover or outbreak potential that have not yet reached large scale or world-wide distribution.

Examples of arboviruses of interest:

- **Alphaviruses**
  - O’nyong’nyong, Ross River, Mayaro

- **Flaviviruses**
  - Usutu, Oropouche, St Louis Encephalitis, Japanese Encephalitis, Yellow Fever

- **Bunyaviruses**
  - Rift Valley Fever virus

- **Tick-borne viruses**
  - Crimean Congo, Powassan, Heartland
The Task Force on »Unknown Viruses»

- The next epidemics will likely be due to viruses emerging from existing classes of viruses
- Evolutionary biology and virology can help anticipate (predict??) the « next ones »

The GVN has been shaping a unique task force based on:
- Best experts of each class of viruses
- Evolutionary virology and biology experts
Using Viral Gene Sequences to Compare and Explain the Heterogeneous Spatial Dynamics of Virus Epidemics

Simon Dellicour, Rebecca Rose, Nuno Rodrigues Faria, Luiz Fernando Pereira Vieira, Hervé Bourhy, Marius Gilbert, Philippe Lemey and Oliver G. Pybus

Reconstructed spatio-temporal diffusion of five RABV data sets:

Phylogeographic analyses based on viral gene sequences provide insight into spatial epidemic processes, in a geographic and temporal context.

It identifies which environmental factors determine RABV spread, and whether those factors are shared or vary among independent outbreaks.
Global Virus Network Training Programs

- Annual Short Course in Medical Virology (IHV)

- Short courses on specific topics (ex: arboviruses)

- Short-term Inter Centers exchange of young scientists

- “North-South” training and capacity building

- Postdoctoral fellowships in Medical Virology
TRAINING: GVN SHORT COURSE

- 4th consecutive year
- 1-week intensive course
- Speakers are experts from the GVN Network
- Takes place at IHV, JHU and NIH
- International participants
- Identification of Emerging Leaders
- GVN Alumni directory - NEW
GLOBAL VIRUS NETWORK
Centers of Excellence and Affiliates
Ongoing GVN activities

GVN ZIKA serum Bank.
Project Lead: Scott Weaver, PhD

GVN Short Course for Emerging Leaders in Medical Virology.
Project Lead: Natalia Mercer, PhD

Hepatitis C Provider Training.
Project Lead: Shyam Kottilil, MD, PhD

Development of a clinical database/global health tablet application for HepB research study.
Project Lead: Shyam Kottilil, MD, PhD


Medical Technology Enterprise Consortium
The new talents

➢ Novel educational and career development programs

➢ Jointly designed by academics and industrial Partners:
  Science
  Management
  Talents identification and development

➢ The new generation of MDs and PhDs
  Africa, SouthEast Asia, South America