COVID-19 : Lessons to be Learned and the Role of the Global Virus Network

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GVN GLOBAL VIRUS NETWORK

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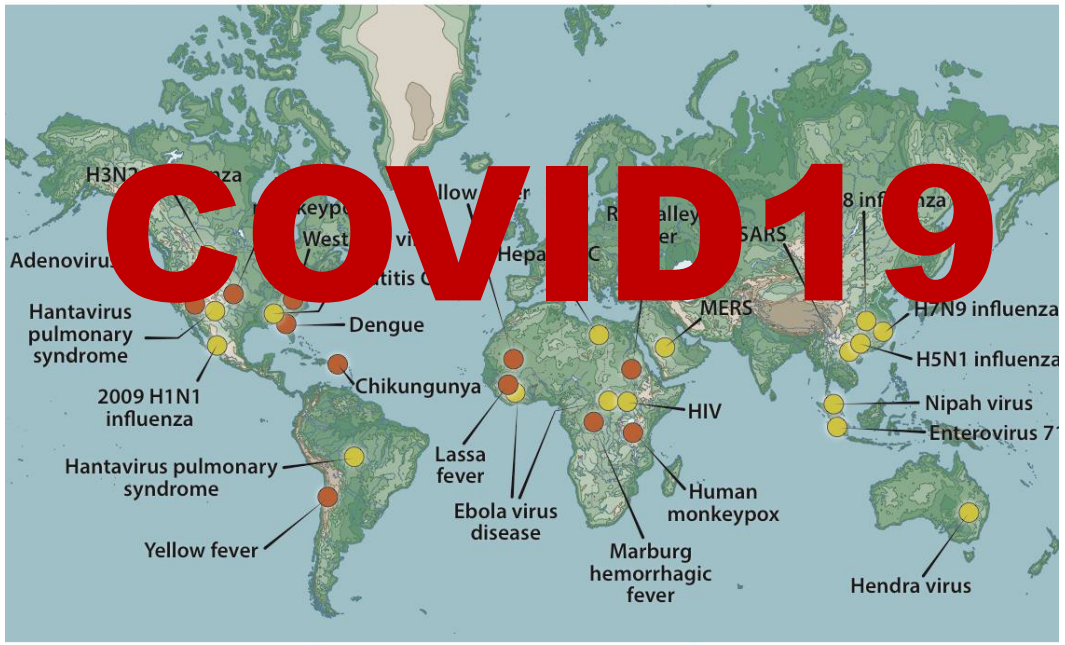
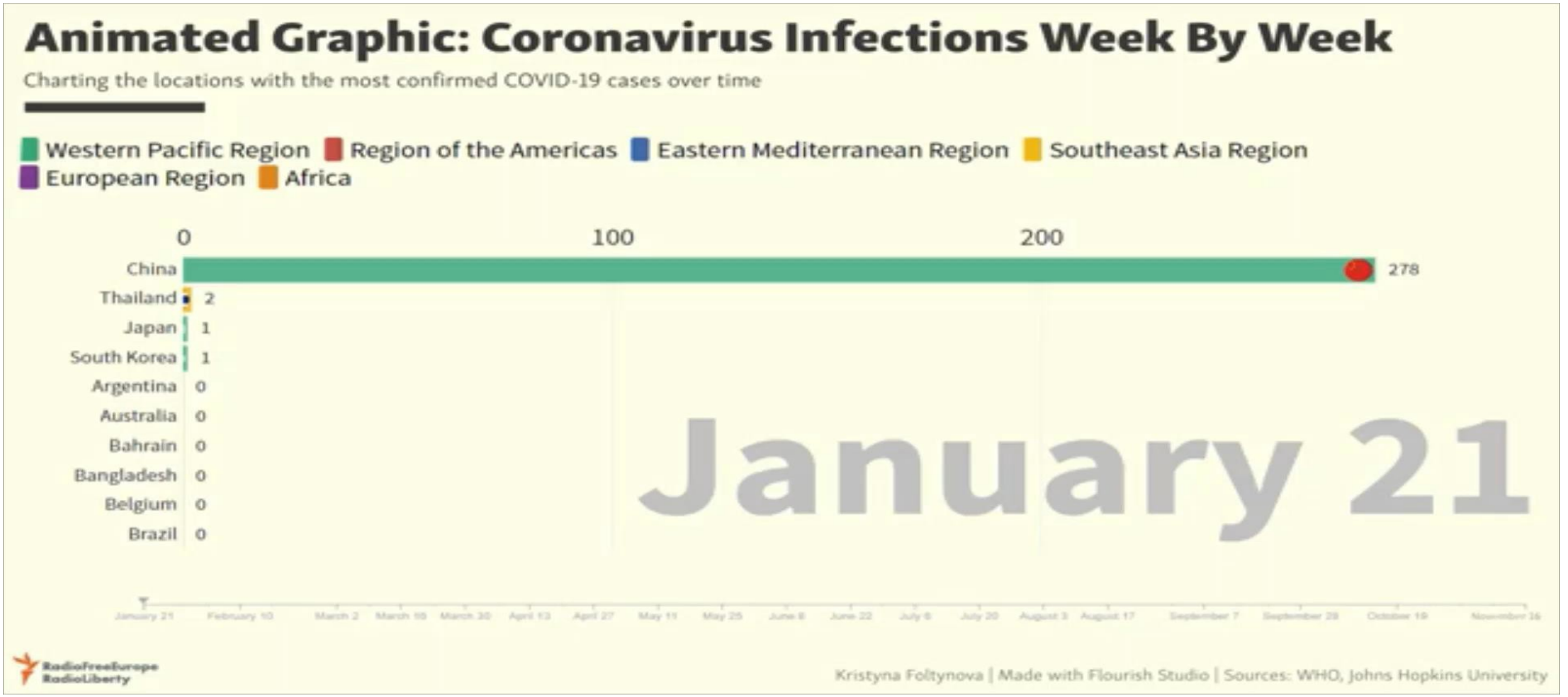
April 15, 2021

Mapping Emerging Viral Diseases

- How to anticipate?
  - Preparedness
- How to react?
  - Task forces
- How to build for the future?
  - Education
  - Training
  - Talent Development



Marston HD, Folkers GK, Morens DM, Fauci AS. *Emerging viral diseases: confronting threats with new technologies.* ***Sci Transl Med.*** *2014 Sept 10;6 (253)*



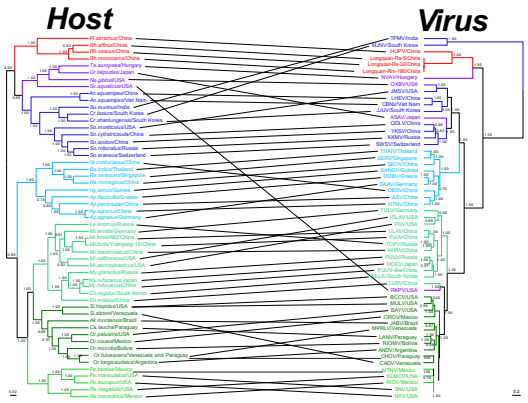
Animated Graphic: Coronavirus Infections Week By Week. (2020, November 16). [Video]. RadioFreeEurope/RadioLiberty.

https://www.rferl.org/a/day-by-day-how-the-coronavirus-spread/30552844.html

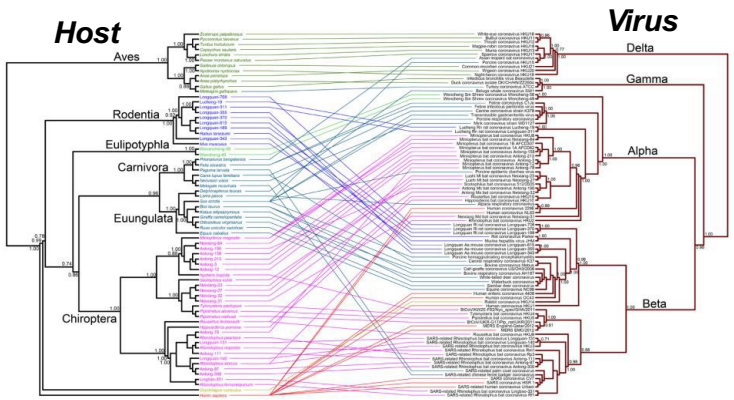
Why Coronaviruses?

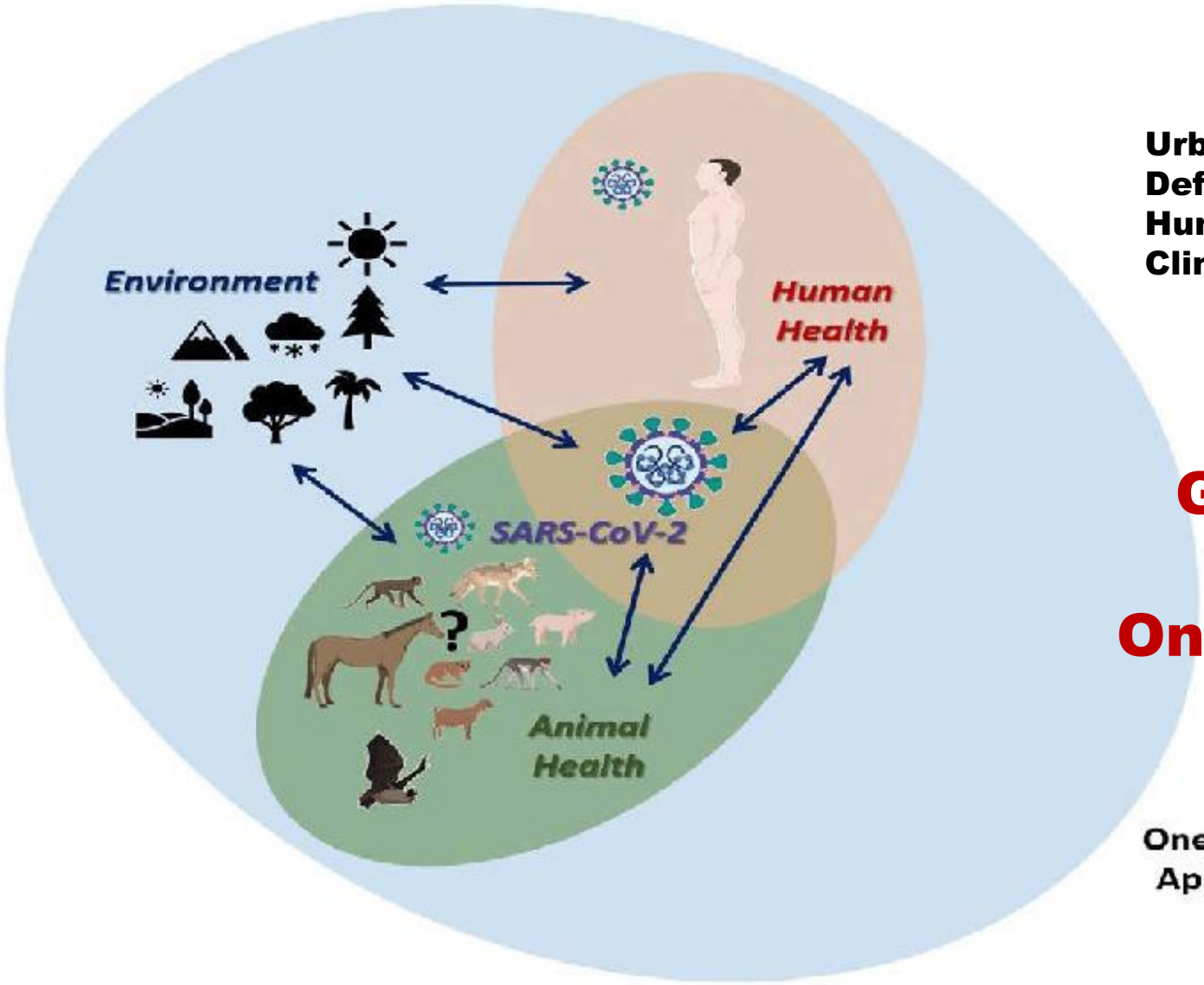
- SARS-CoV-2 is the 7th documented human coronavirus
- Four cause common colds (229E, HKU1, NL63, OC43); three cause severe disease (SARS-CoV, MERS-CoV, SARS-CoV-2)
- Five have emerged the last 20 years (SARS-CoV, MERS-CoV, HKU1, NL63, SARS-CoV-2)
- Bats are involved in the emergence of five (SARS-CoV, MERS-CoV, NL63, 229E, SARS-CoV-2)

Hantaviruses: *sporadic host jumping*



Coronaviruses: *Frequent host jumping*





Urbanization
Deforestation
Human migrations
Climate changes

Global And One Health

One Health Approach

Novel Modes of Global Health Governance

- **Gavi**, The Vaccine Alliance (formerly Global Alliance for Vaccines and Immunization)
- International AIDS Vaccine Initiative (**IAVI**)
- Drugs for Neglected Diseases Initiative (**DNDI**)
- Africa Centers for Disease Control and Prevention (**Africa CDC**)
- Foundation for Innovative New Diagnostics (**FIND**)
- **PATH** (formerly the Program for Appropriate Technology in Health)
- **Coalition for Epidemic Preparedness Innovation:** CEPI

COVID-19 World Preparedness and Response: Lessons Learned

- **It is not a crisis – it is a new era.**
- **Multidisciplinary pandemic response networks**
  - Collaborations are needed among university, industry, government and communities to merge the efforts and find solutions together.
  - Viral Pandemic Readiness Alliance (VPRA)
- **Global and One Health**
  - The true international collaborations, can support future pandemic preparedness with distribution of diagnostics, vaccine and therapeutics and other interventional measures.
- **Training the next generation of virologists**
- **Reliable channels for dissemination of scientific knowledge and information sharing**

The Importance of Surveillanceand Alert Networks

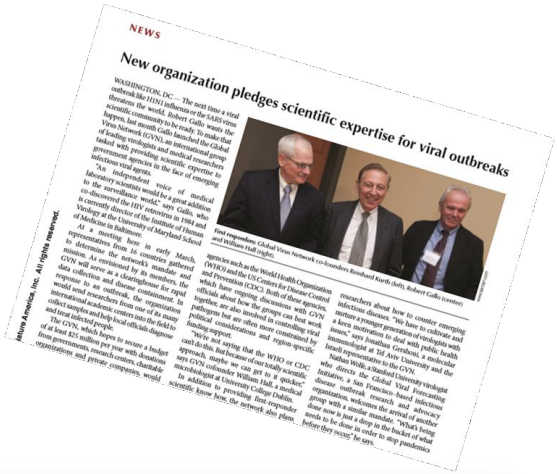
- Assist countries in their efforts to fight against diseases, by providing an appropriate technical support to populations in a timely manner
- Investigate and characterize sanitary events and analyze the risks of a rapidly-emerging threat
- Support the national authorities' efforts to prepare for sanitary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

GOARN
Global Outbreak Alert and Response Network


"If you want to go fast,
go alone.
If you want to go far,
go together."
-African Proverb

Global Virus Network

- The GVN was co-founded in 2011
- A non-profit global organization based in Baltimore, Maryland, USA
- A coalition comprised of leading virologists working to:
  - Advance discovery and knowledge on how viruses cause disease
  - Develop drugs and vaccines to prevent illness and death


NEWS

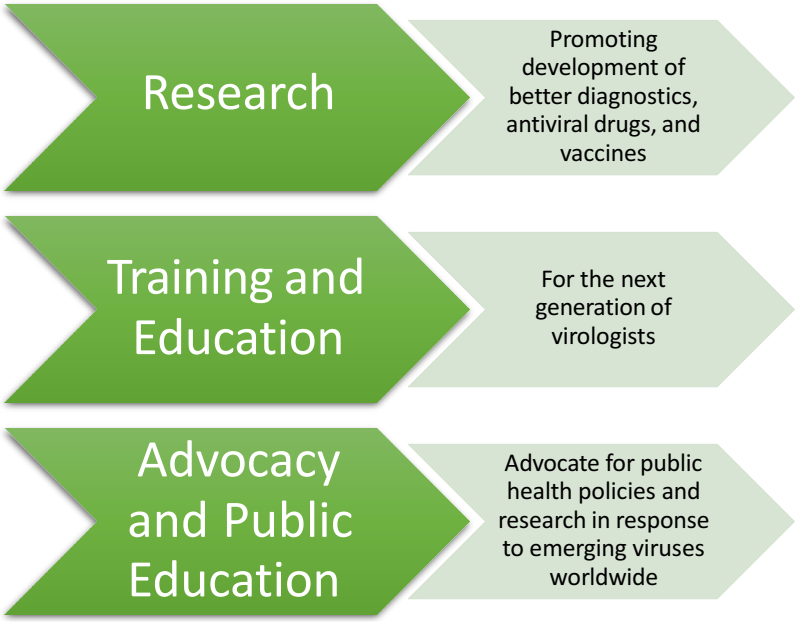
New organization pledges scientific expertise for viral outbreaks

Vision

"A world prepared to prevent, contain and control viral epidemic threats, through the collaboration of a global network of expert virus laboratories."

Mission

"To strengthen medical research and response to current viral cases of human disease and to prepare for new viral pandemic threats."



GVN
GLOBAL VIRUS NETWORK

GVN Centers of Excellence

- **Centers of Excellence** are the **KEY COMPONENT** of the GVN
- Criteria for a GVN Center of Excellence:
  - The Director is a noted medical virologist
  - The Center is currently productive, and has deep expertise in 2-3 viral areas
  - Commit to capacity building in weaker institutes especially in resource-poor nations.
  - Support GVN's central operation through inclusion on grant and contract applications, fundraising events, direct donations or other means.

The Network

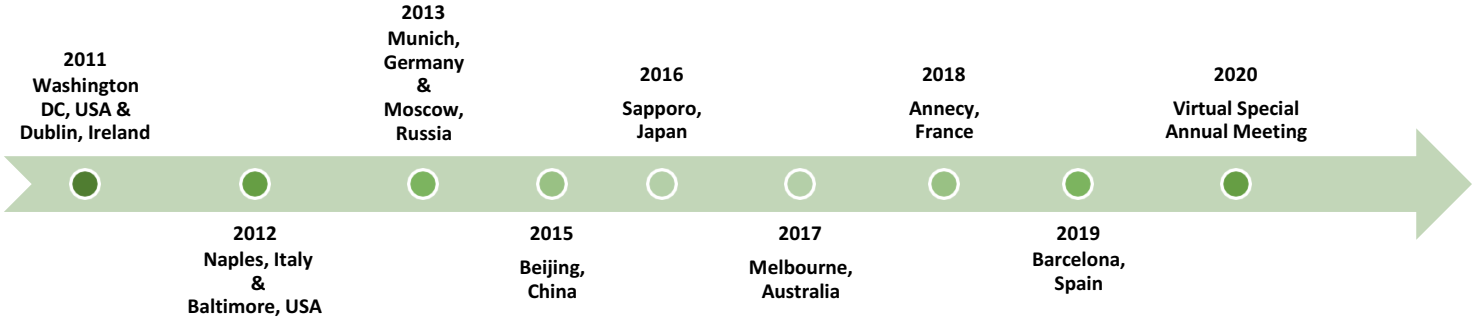
- **57** Centers of Excellence
- **11** Affiliated Institutions
- In **33** Countries

GVN Virus Expertise

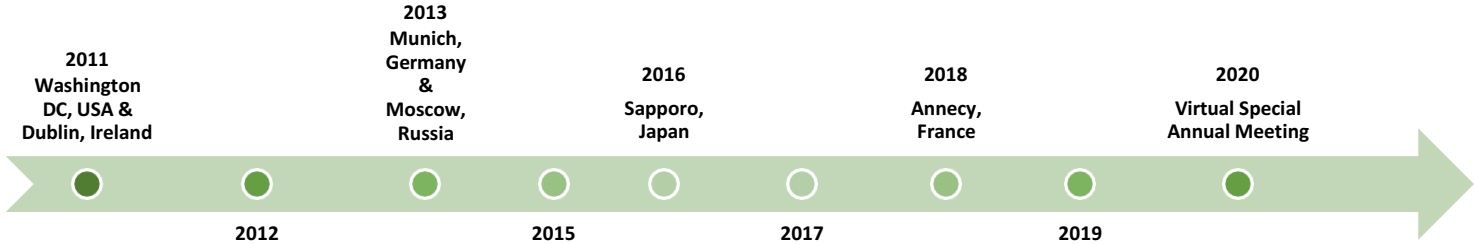
Provide the world's 1st Pre-Staged Teams of Virus Experts, by Class

Countries	Institutions	Retroviruses	Poxviruses	Herpesviruses	Respiratory viruses	HPV	Hemorrhagic fever viruses	Hepatitis viruses	Rabies viruses	Enteric viruses	Arboviruses
Argentina	IBBM, Universidad Nacional de La Plata						■				
Australia	Peter Doherty Institute University of Melbourne	■			■			■		■	■
Belgium	Gembloux Agro-Bio Tech	■									
China	National Centre for AIDS/STD Control & Prevention, China CDC	■			■	■		■			■
France	Institut Pasteur	■		■	■	■	■	■	■	■	■
Germany	Institute of Virology, Technical University of Munich	■		■	■						
Germany	Robert Koch Institute, Berlin	■	■		■		■	■		■	■
Germany	Institute for Virology, Philipps-Universität Marburg				■		■				
Germany	University of Veterinary Medicine Hannover			■	■				■		■
Grenada	St. George's University, Grenada, West Indies	■	■								■
India	Amrita Institute of Medical Sciences & Research Centre	■						■		■	■
India	Rajiv Gandhi Centre for Biotechnology (RGCB)				■	■					■
Ireland	Univ. College, Dublin	■						■			■
Israel	Tel Aviv University	■	■	■	■		■	■		■	■
Italy	University of Padova	■	■	■	■	■	■				■
Jamaica	University of West Indies	■			■						■
Japan	National Institute of Infectious Diseases	■			■						■
Netherlands	Erasmus University Hospital Rotterdam	■	■	■	■	■	■	■	■	■	■
Nigeria	Institute for Human Virology -Nigeria	■			■	■	■	■			■
Russia	Moscow Center for HIV/AIDS Prevention and Treatment	■		■	■			■			
South Africa	NICD of the National Health Laboratory Service						■				■
South Korea	International Vaccine Institute	■			■			■		■	■
Spain	CReSA, Barcelona				■						■
Spain	Centro de Biología Molecular Severo Ochoa (CBMSO), Madrid	■	■	■	■			■			■
Sweden	Karolinska Inst. and Univ. Hospital, Stockholm	■		■		■		■			■
Estonia	University of Tartu	■		■		■		■			■
UK-England	The Pirbright Institute Pirbright		■		■					■	■
UK-Scotland	Scotland, United Kingdom, Medical Research Council, (MRC) Glasgow	■		■	■	■	■	■	■		■
USA	Johns Hopkins University	■		■	■		■	■		■	■
USA	The Scripps Research Institute, La Jolla	■			■		■	■			
USA	J. Craig Venter Institute			■	■		■	■		■	■
USA	Univ. of Rochester Medical Center, School of Medicine and Dentistry	■	■		■					■	
USA	University Texas Medical Branch, UTMB, Galveston		■		■		■				■
USA	Center for Global Health (CGH), University of Michigan	■				■		■		■	■
USA	University of Pittsburgh Cancer Institute	■		■	■	■					
USA	Icahn School of Medicine at Mount Sinai				■		■	■			■
USA	Colorado State University, Fort Collins	■					■				■
USA	Gladstone Institute of Virology and Immunology	■						■			
USA	Univeristy of Miami	■		■				■			■
USA	University of Buffalo	■			■		■	■			
USA	Institute of Human Virology, UMD School of Medicine										
USA	Emory University	■					■	■		■	■

GVN International Meetings



GVN International Meetings



2020 GVN Special Annual Meeting

Epidemics & Pandemics in the Modern Era

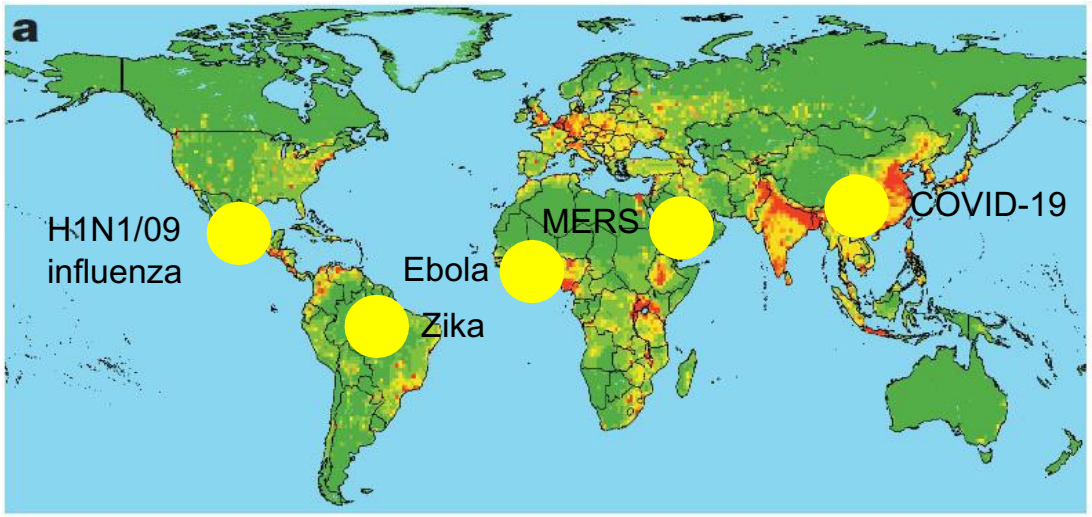
September 22-23

Media Conference on the 24th

GVN

GLOBAL VIRUS NETWORK

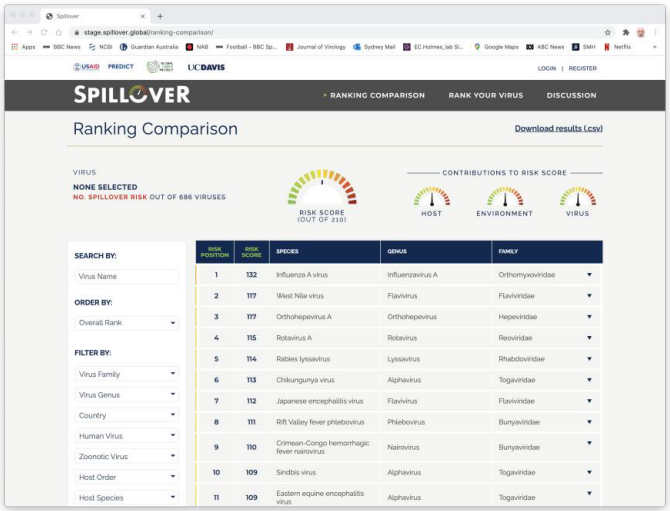
Can We Predict Disease Emergence?



"Hotspots" of Emergence

Distribution of zoonotic pathogens emerging in humans from wildlife

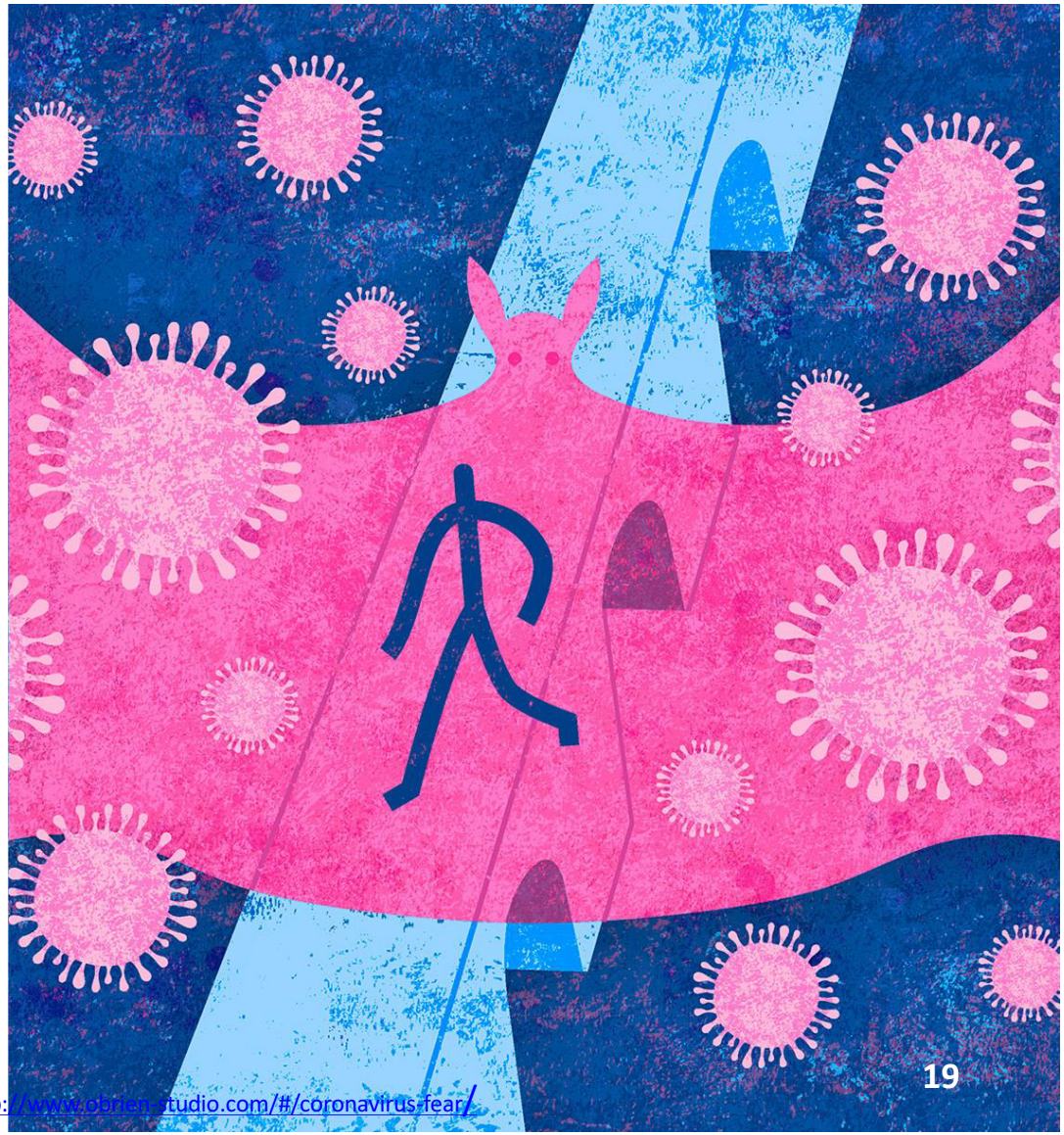
Jones *et al*. *Nature* 451, 990-994 (2008)



- Online tool – "spillover": https://stage.spillover.global/ranking-comparison/
- Machine learning?

Surveillance

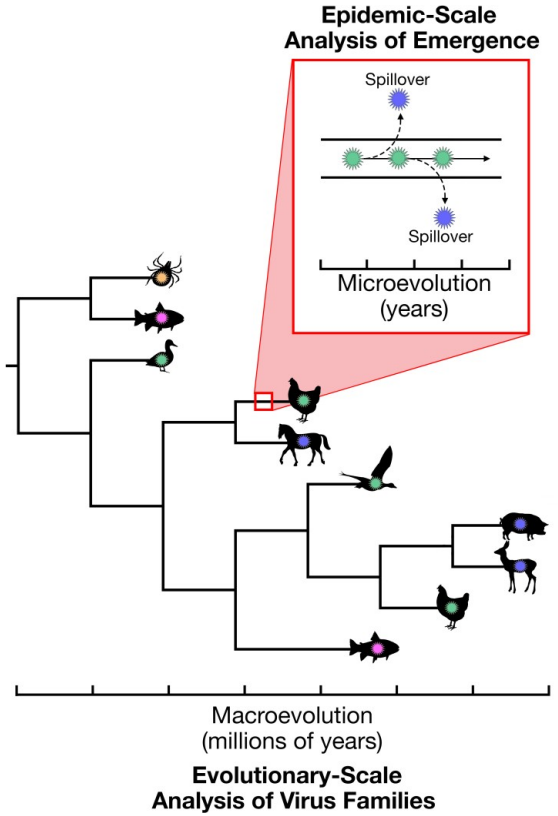
- We cannot predict future pandemics but we can improve preparedness and reactivity
- Humans are modifying ecosystems & accelerating transmission events.
- Major risk factors for the next epidemics and pandemics: Animal viruses .
- **Humans are the best sentinels.**
- **Focus on the surveillance efforts to the human populations who interface with animals**
- **Establish global data sharing mechanisms**.



O'Brien, J. (2020, March 24). Coronavirus Fear, Retrieved November 11, 2020, from http://www.obrien-studio.com/#/coronavirus-fear/

Why Genomic Prediction Won't Work

- Huge number of possible viruses
- Genome sequencing of viruses does not identify those that can infect or spread epidemically in humans
- Testing whether these viruses can infect human cells will take a huge number of person hours
- RNA viruses evolve so rapidly that regular surveys are needed (and human adaptation may be needed)
- Phylogenetic comparisons consider evolutionary time-scales (millions of years) while emergence occurs on epidemiological time-scales (decades)



How to do Things Better

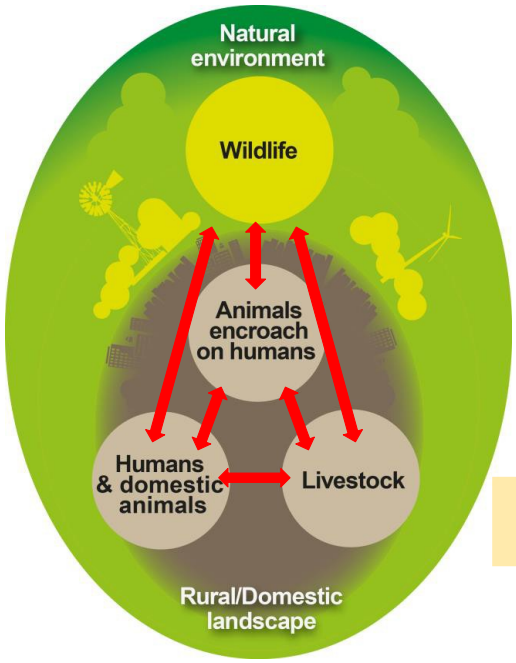
- Fight climate change
- Reduce our exposure to wildlife – deforestation, wildlife trade, wet markets, zoning (e.g. planting trees)
- Establish global genomic, serological (VirScan) and social media surveillance of people living and working at the human-animal interface

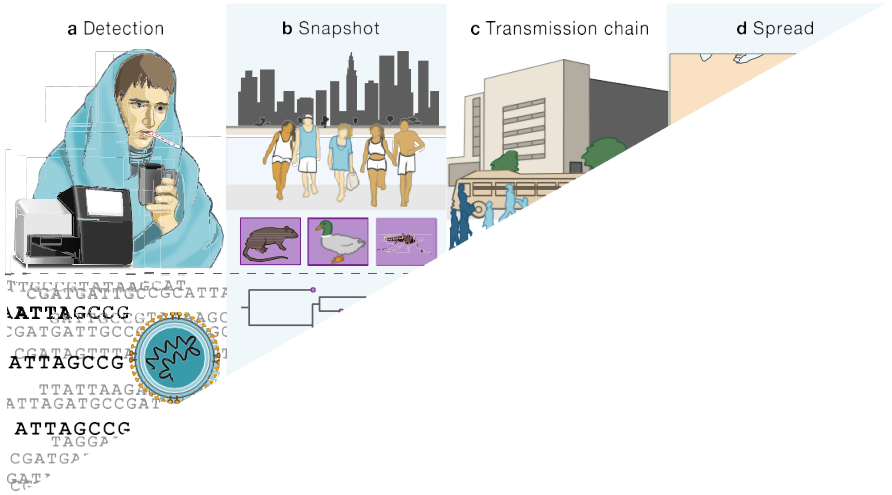
Huanan seafood market, Wuhan

Modern Genomic Epidemiology

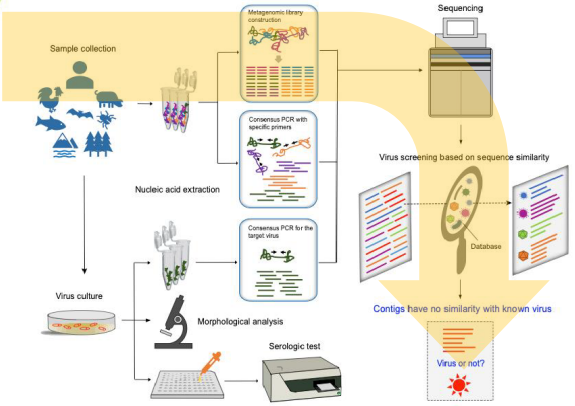
- Now have the tools for the real-time genomic investigation of infectious disease outbreaks

The zoonotic interface





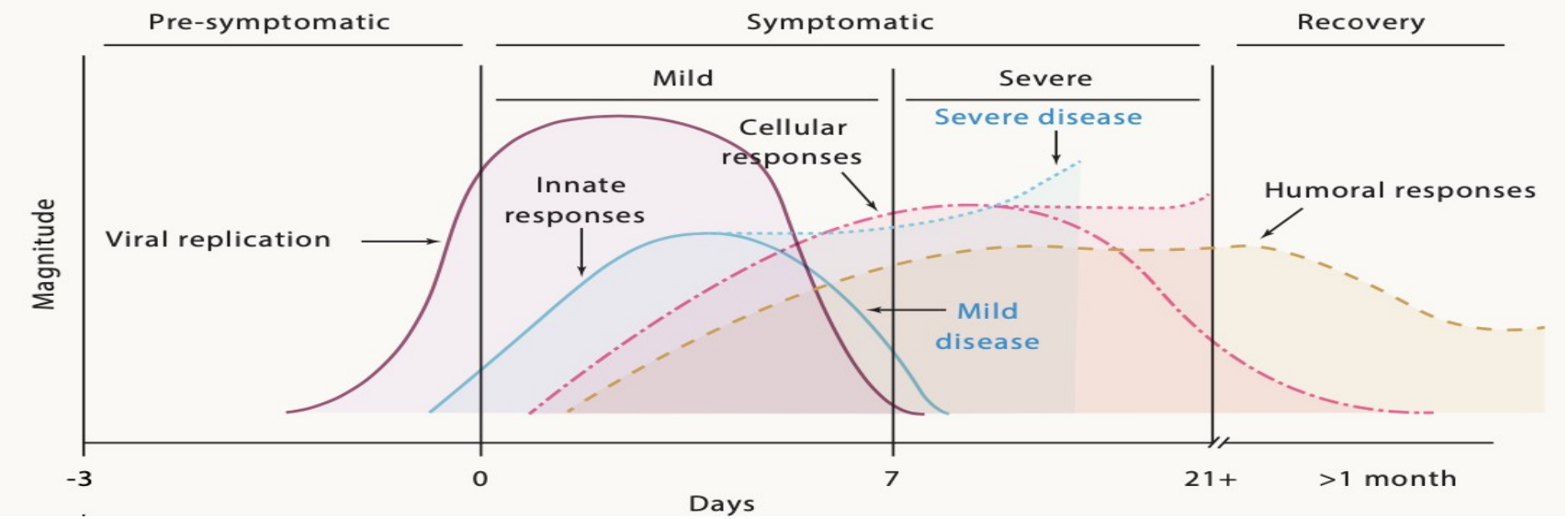
Meta-transcriptomics



Virus sequenced on Jan 5th by the team of Prof. Yong-Zhen Zhang (Fudan University)

Lung manifestation of COVID-19
Epithelium / monocyte / neutrophil crosstalk

Subbarao et al. Immunity 2020



EPITHELIUM
> **Immune avoidance**

MONOCYTES
> **Cytokine release syndrome (CRS)**

NEUTROPHILS>
ARDS

EPITHELIUM
> Tissue damage / repair

CELLS?
> Long-haul symptoms

Receptors: Angiotensin Converting Enzyme (ACE)2 and Neuropilin-1

CORONAVIRUS

Neuropilin-1 facilitates SARS-CoV-2 cell entry and infectivity

Ludovico Cantuti-Castelvetri et al

Neuropilin-1 (NRP1), known to bind furin-cleaved substrates, significantly potentiates SARS-CoV-2 infectivity, an effect blocked by a monoclonal blocking antibody against NRP1. Pathological analysis of olfactory epithelium obtained from human COVID-19 autopsies demonstrates that SARS-CoV-2 infects NRP1-positive cells facing the nasal cavity.

Neuropilin-1 is a host factor for SARS-CoV-2 infection

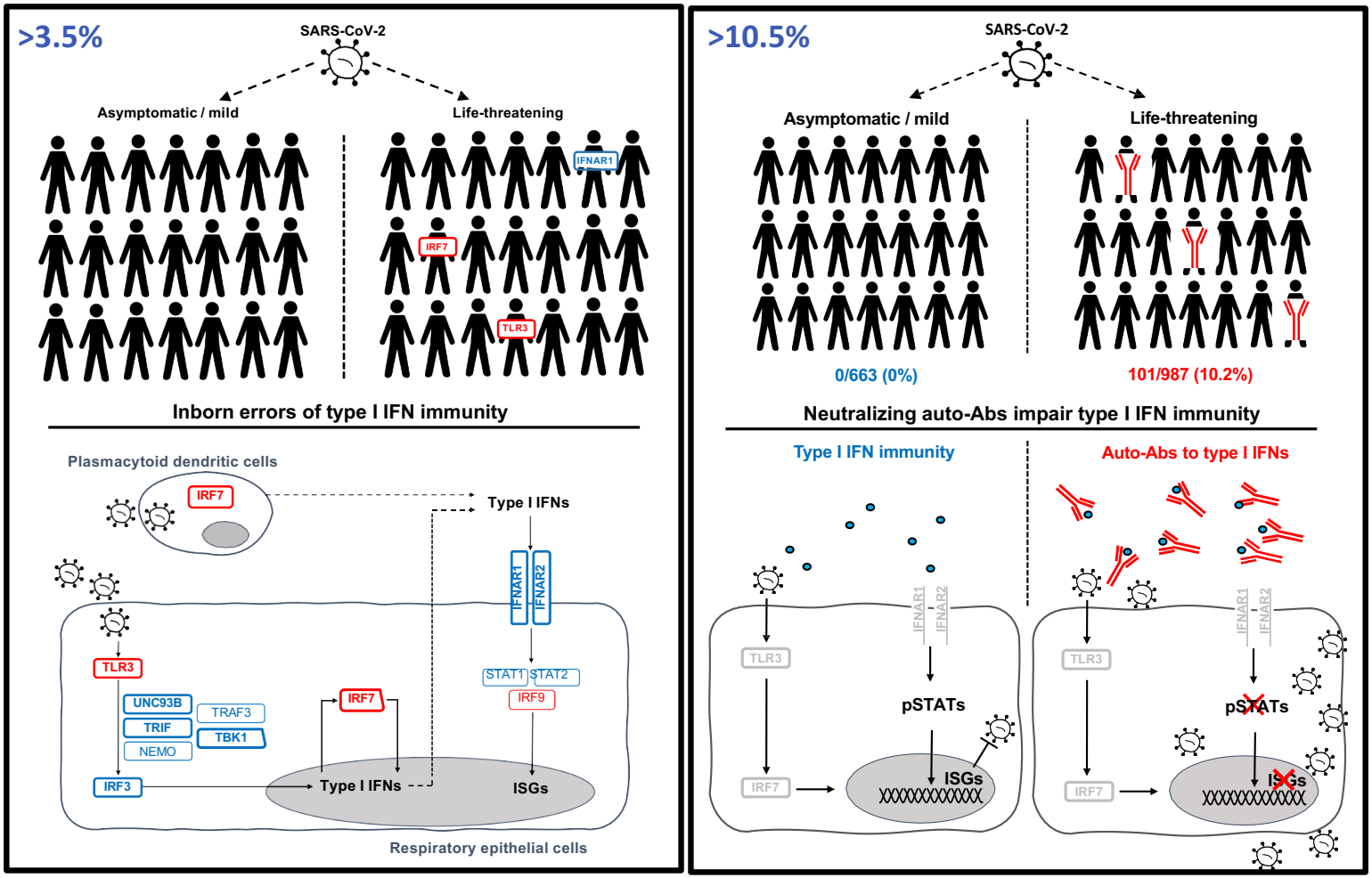
James L. Daly1 et al

Science 11/2020

The impact of the host human genetics

Impaired type I IFN immunity: two mechanisms

Casanova et al Science 2020



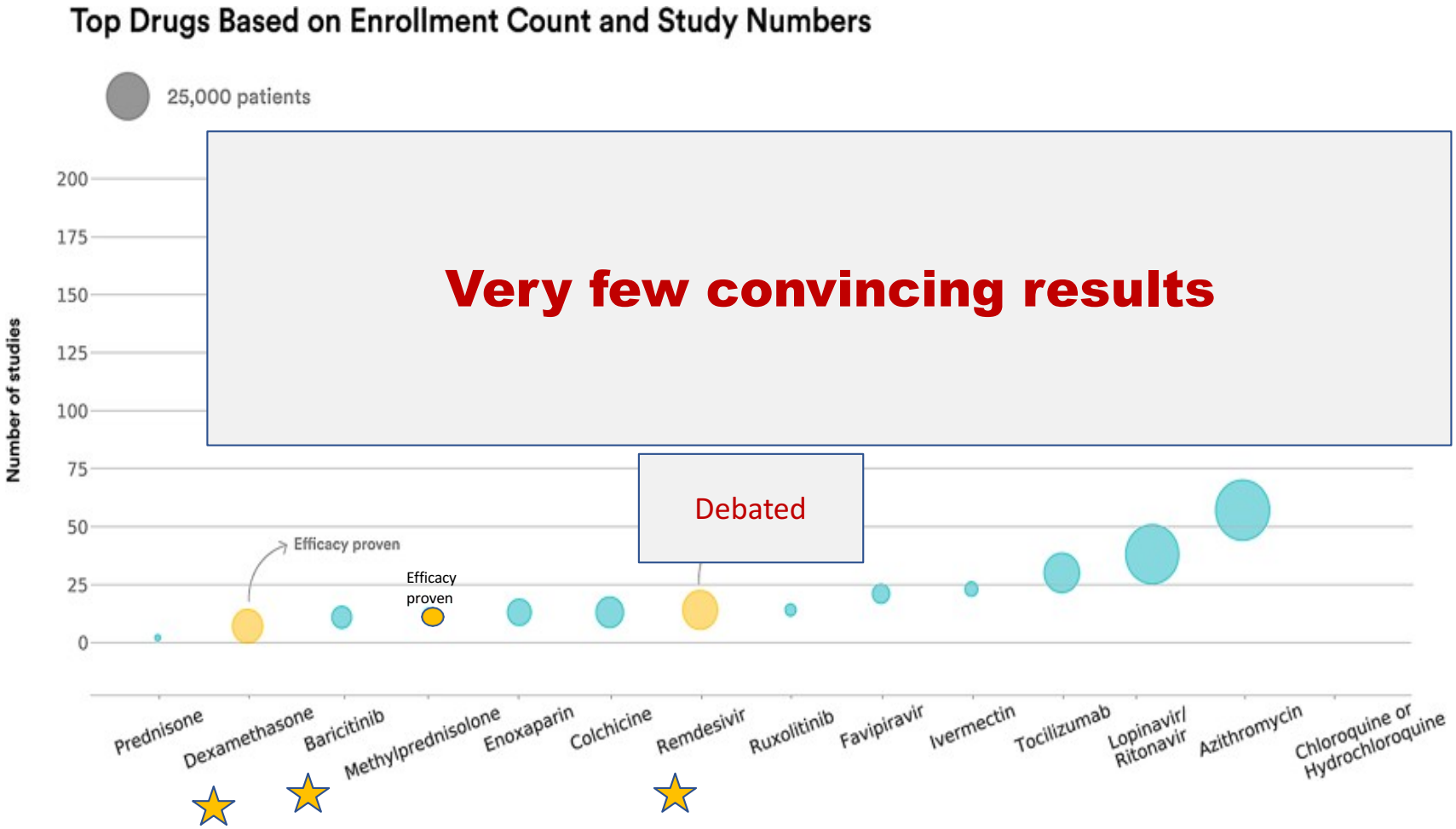
THE MAJOR GENETIC RISK FACTOR FOR SEVERE COVID-19 IS INHERITED FROM NEANDERTHALS

Figure 1 | Uneven global spread of a genetic risk factor for COVID-19. Zeberg and Pääbo[2] report that a long sequence of DNA that is associated with severe COVID-19 infection and hospitalization is derived from Neanderthals. The sequence is unevenly distributed across modern human populations. This map shows the frequency at which the risk factor is found in various populations from around the world. The sequencing data for these populations were gathered by the 1000 Genomes Project[10]. (Adapted from Fig. 3 of ref. 2.)

COVID-19 Therapeutics

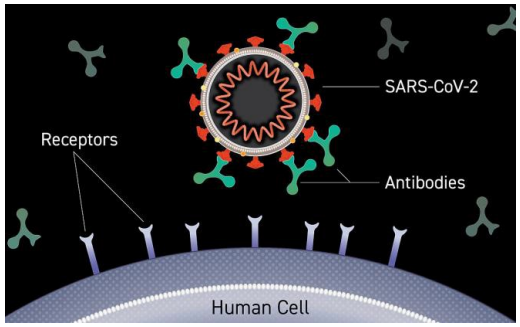
- Drug repurposing **and** drug discovery
- Targeting multiple pathways and combining antivirals and immunomodulatory molecules.
- The possibility of developing broad spectrum antivirals: effective against coronaviruses, influenza and filoviruses.

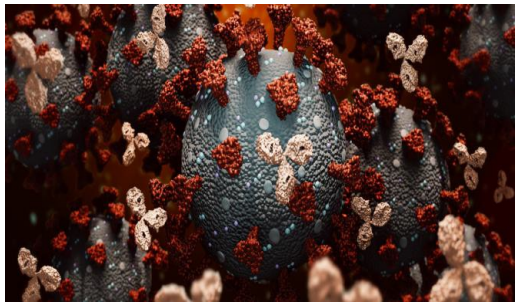
Drug repurposing studies: Over 1,200 COVID-19 clinical trials have been initiated since January to July 2020 (clinicaltrials.gov)



Therapeutic Monoclonal Antibodies Targeting the Spike Protein of SARS-CoV-2

- Preventing viral entry to the cell by binding to the receptor-binding domain (RBD) of the spike protein or blocking the interaction between RBD and the ACE2 receptor
- FDA's approval: Bamlanivimab (LY-CoV555, Eli Lilly); cocktail of casirivimab and imdevimab (Regeneron) for treatment of mild to moderate COVID-19 patients
- Experimental approaches: use of cocktail monoclonal antibodies targeting different epitopes of the S protein
- Effective for early stages of mild and moderate COVID-19
- Required continuous evaluation of safety and effectiveness of these treatments





Therapeutic Monoclonal Antibodies for curving the COVID-19 Cytokine Storm

- Blocking the biological activity of IL-1 and IL-6;
  Inhibiting JAK signal transducer and activator of transcription pathway
- Clinical outcomes: contradictory
  Required continuous evaluation of safety and effectiveness for COVID-19 treatment

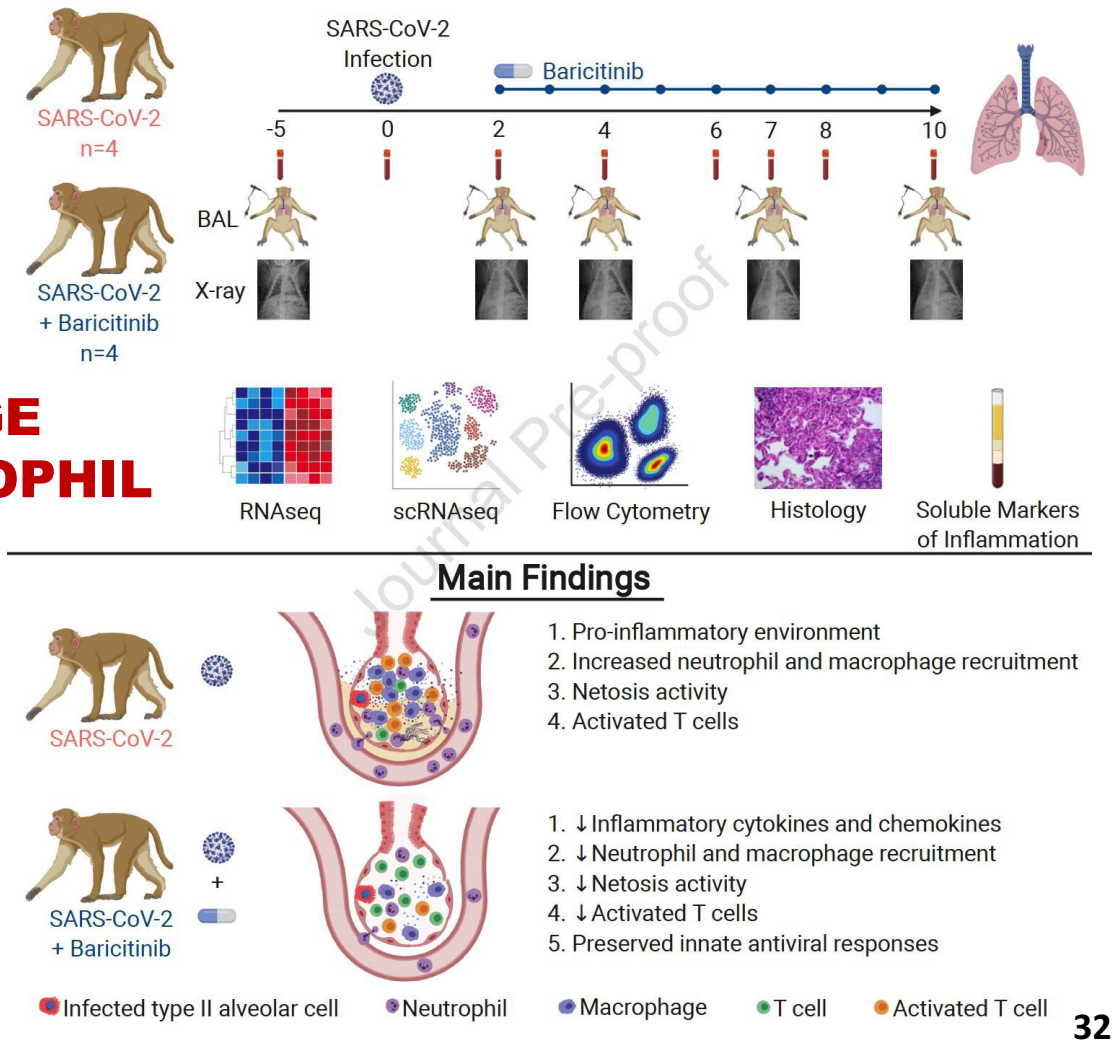
Randomized clinical trials ongoing on promising inflammatory strategy

Target	Drug Type	Drug (Monoclonal Antibody)
IL 6 signaling	Anti-IL 6	Clazakizumab, Siltuximab
	Anti-IL6 receptor	Sarilumab, Tocilizumab
IL 1 signaling	Anti-IL1β	Canakinumab
	Anti-IL1 repector	Anakinra
JAK-STAT signaling	JAK1/JAK2 inhibitors	Baricitinib, Ruxolitinib
	JAK1/JAK3 inhibitors	Tofacitinib

JAK-STAT: The Janus kinase/signal transducer and activator of tran-ions; IL: Interleukin

BARICITINIB TREATMENT RESOLVES LOWER AIRWAY MACROPHAGE INFLAMMATION AND NEUTROPHIL RECRUITMENT IN SARS-COV-2-INFECTED RHESUS MACAQUES

Timothy N. Hoang et al
Cell 2020



COVID19 Treatment
When high through put screenings and serendipity helps

- **Nitazoxanide: anti-parasitic drug with excellent safety profile and in vitro and in vivo(?) activity against SARS-CoV-2**
  (Jean-Francois Rossignol, Romark LLC)

- **The Nicotine-Nicotinic Acetyl Choline Receptor-COVID19 Connection**
  (Jean-Pierre Changeux, Institut Pasteur)

- **Antiviral sigma-1 receptor ligands: antihistamines in the histamine-1 receptor binding class : diphenhydramine, hydroxyzine and azelastine**
  (David Ostrov, University of Florida)

Nitazoxanide and COVID19

An anti-parasitic agent with excellent safety profile

- Protozoa: *Cryptosporidium parvum, Giardia intestinalis, Entamoeba histolytica, Blastocystis hominis & Balantidium coli*
- Nematodes: *Enterobius vermicularis, Ascaris lumbricoides, Necator americanus, Ancylostoma duodenale, Trichuris trichiura, Strongyloides stercoralis*
- Cestodes: *Taenia saginata, Hymenolepis nana*
- Trematode: *Fasciola hepatica*

Nicotine-Nicotinic Acetyl Choline Receptor-COVID19

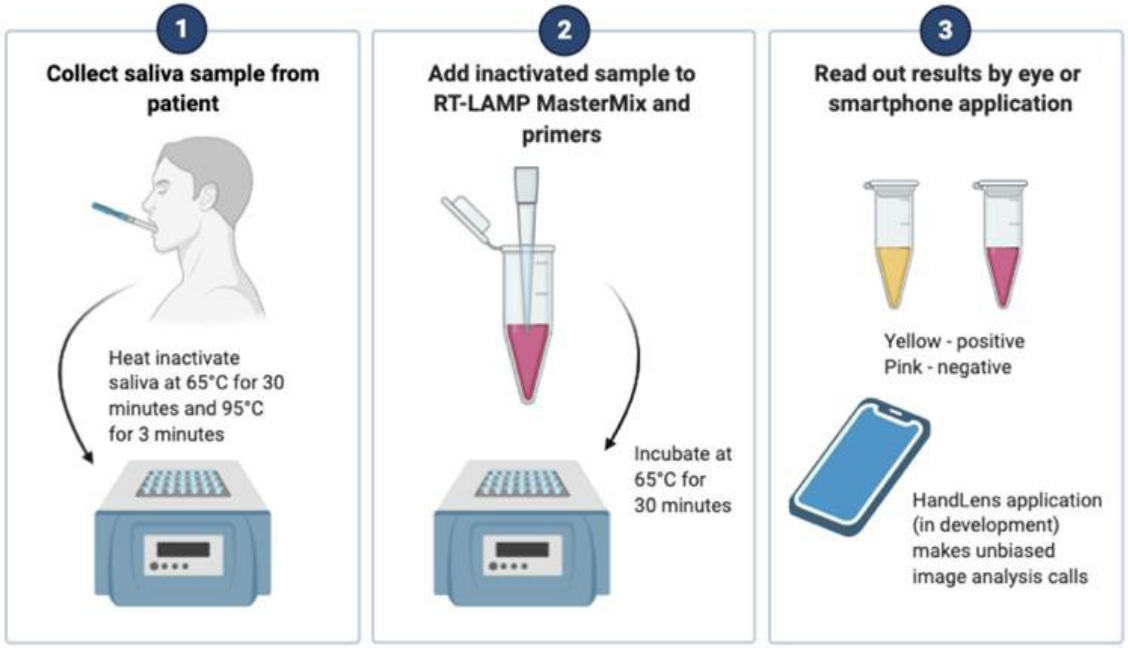
- Nicotinic acid receptor as an immunomodulator
- Decreased prevalence of COVID19 in smokers
- Nicotinic acetyl receptor binding to SARS-CoV2 ?
- The impact of smoking? Nicotine patches as treatments?

A nicotinic hypothesis for Covid-19 with preventive and therapeutic implications
Jean-Pierre Changeux , Zahir Amoura *et al.*
Proceedings of French Academy of Sciences (Comptes Rendus Biologies)
2020, 343, no 1

COIVD-19 Diagnostic:

- The most needed: **Rapid diagnostic tests,** whether molecular or immune-based
- **Salivary sampling** can be used instead of nasal swabs, i.e. RT-LAMP test
- **Serological assays**: offering major insights both epidemiology and neutralization capacity of detected antibodies.
- **Novel organizational schemes**: rapid translation from technology-driven research to routine testing, and partnerships between academic and industrial partners should be reinforced in an international context.

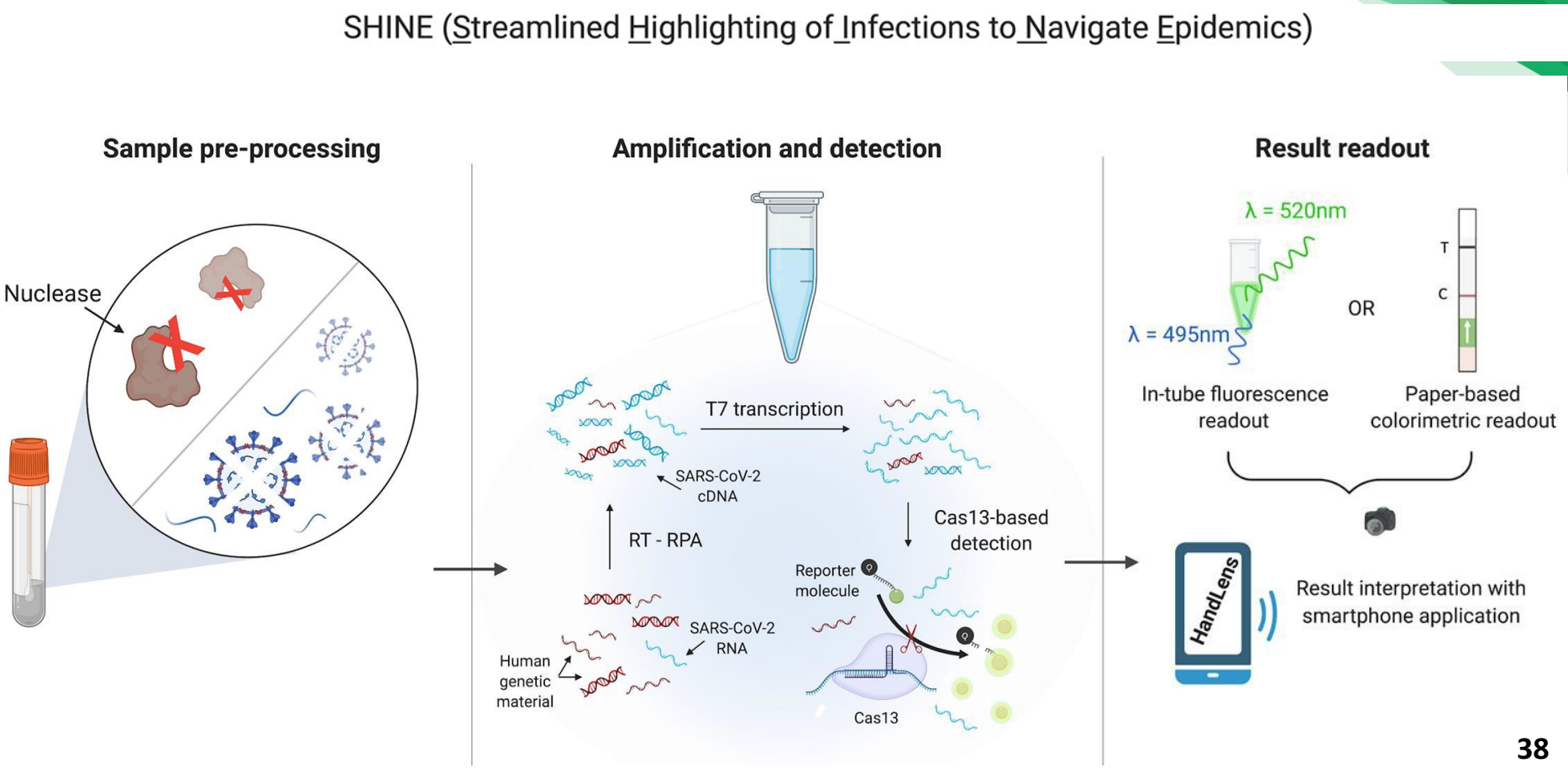
Viral surveillance using colorimetric tests like RT-LAMP



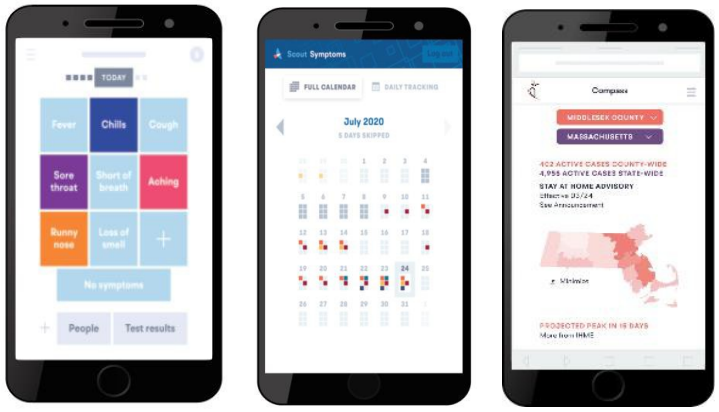
- **Single-temperature SARS-CoV-2 RNA detection**
- **Rapid turnaround time of ~65 minutes**
- **Low cost of ~$5-10 a test**

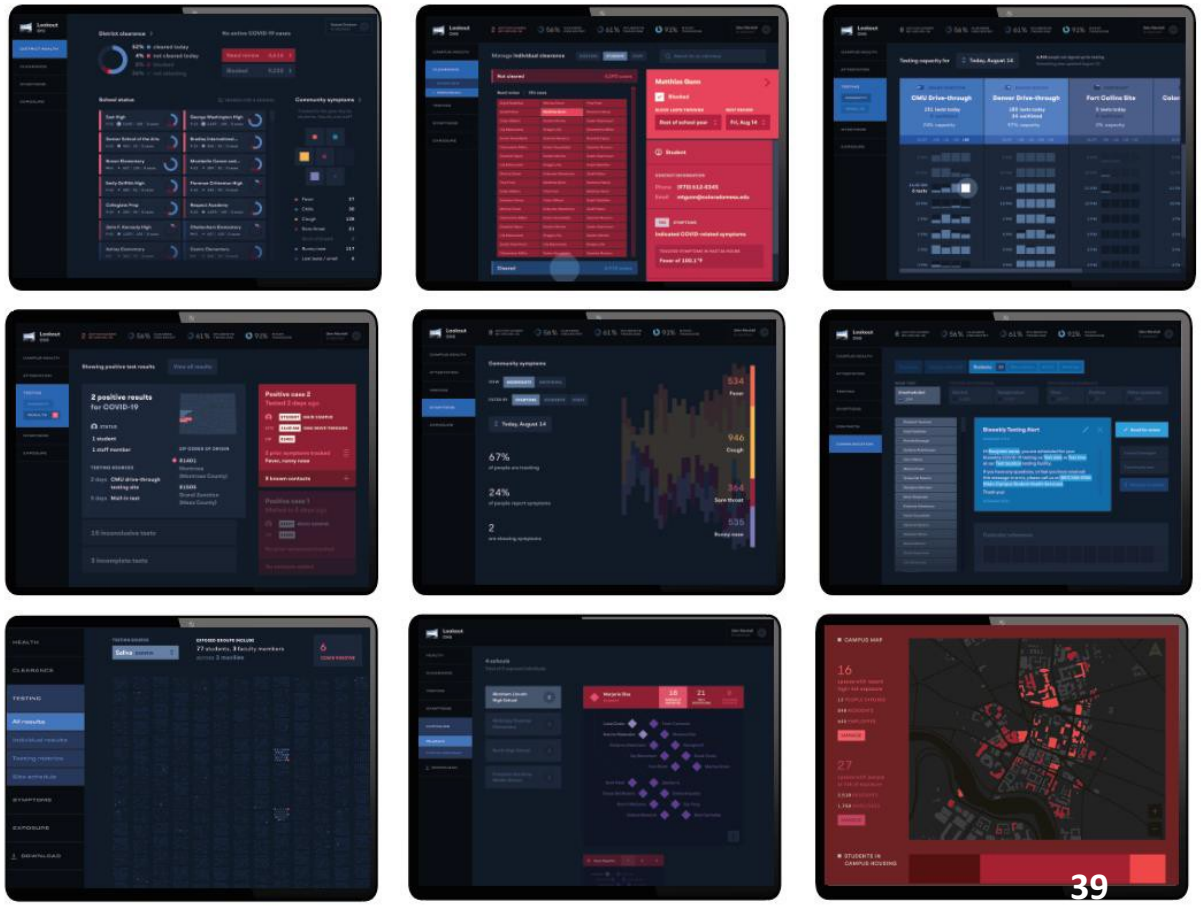
Dr Pardis Sabeti, Harvard Medical School; Broad Institute

CRISPR-based technologies for point-of-care testing



Scout App & LookOut Dashboard





- Full suite for viral surveillance, including daily user attestation, diagnostic integration, and administrator dashboard
- Live at Colorado Mesa University, Sarasota Military Academy, with more sites in the onboarding process

ANTIGEN RAPID TESTS, NASOPHARYNGEAL PCR AND SALIVA PCR TO DETECT SARS-COV- 2: A PROSPECTIVE COMPARATIVE CLINICAL TRIAL

Jean Marc Schwob MD, Alix Miauton MD, Dusan Petrovic PhD, Jean Perdrix MD, Nicolas Senn MD PhD, Katia Jaton MD PhD, Opota Onya PhD, Alain Maillard MD, Gianni Minghelli MD, Jacques Cornuz MD MPH, Gilbert Greub MD PhD, Blaise Genton MD PhD, Valérie D'Acremont MD PhD

Figure 2: Sensitivity of three brands of antigen ROT compared to NP PCR: A) all positive patients; B) positive patients with viral loads 10^6 copies/ml (supposedly significantly contagious)

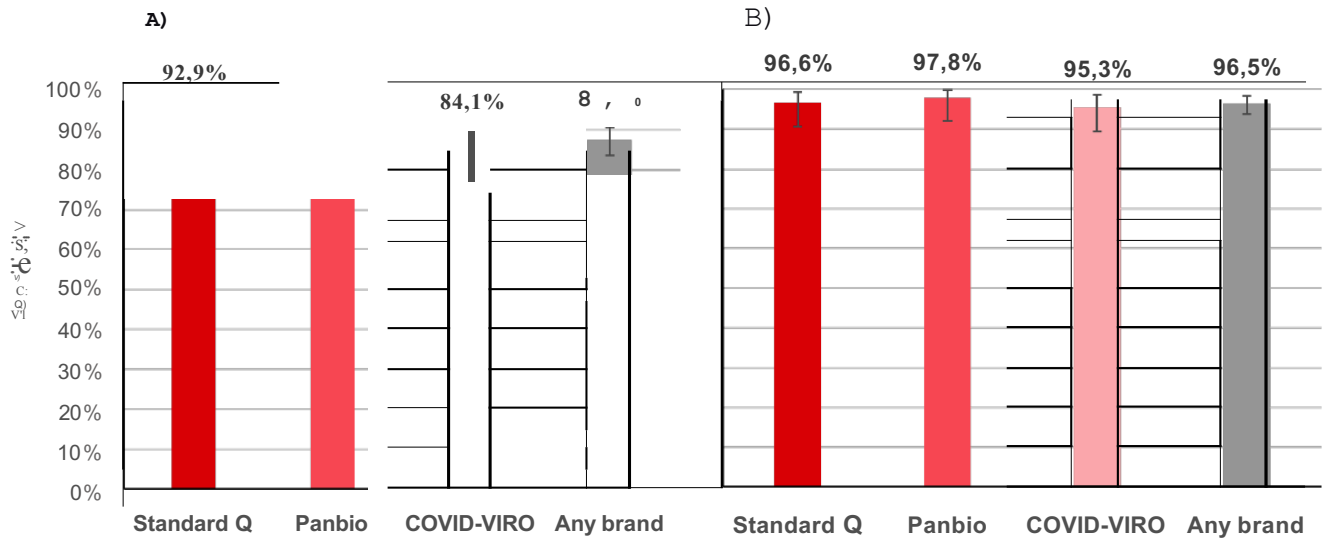
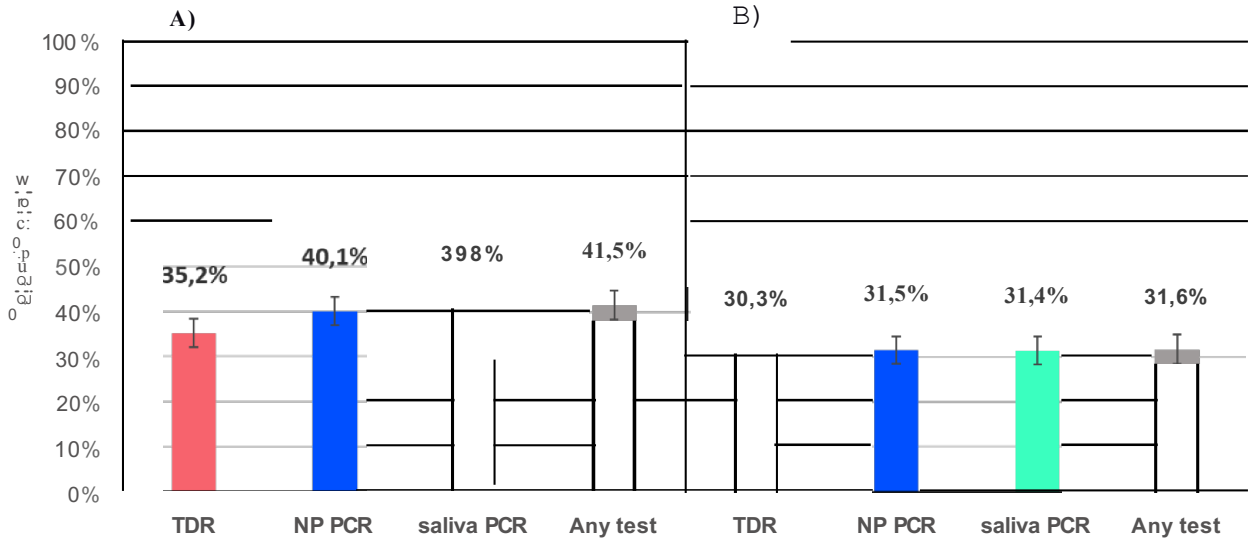


Figure 1: Detection rates of COVID patients by RDT, NP PCR and saliva PCR: A) all positive patients; B) positive patients with viral loads $2*10^6$ copies/ml by any PCR (supposedly significantly contagious)



CAN DOGS SMELL COVID?

Research groups around the world are testing whether dogs can detect COVID-19 by smell.

moderna

BIONTECH

Pfizer

COVID-19 Vaccine Race

Debinski, G., & Winkleman, A. (2020, November 9). The Graphic Truth: The COVID vaccine race [Digital image]. Retrieved November 19, 2020, from https://www.aeromedin.com/the-graphic-truth-the-covid-vaccine-race-2648813281

COVID-19 Vaccines (1):

- **Different types/formulas**
  - Virus-Based Vaccines
  - RNA/DNA (Nucleic Acid) Based Vaccines
  - Viral Vector Vaccines
  - Protein-Based Vaccines
  - Others

Questions:

- **Duration of protection?**
- **Efficacy in elderly, diabetes etc..?**
- **Protection against asymptomatic infections?, severe infections?**
- **Correlates of protection?**
- **Safety?**
- **Risk in anti-SARS-CoV2 positive individuals?**

COVID-19 Vaccines (2):

- Priorities? : Healthcare workers, Diabetes, etc.
- Mass vaccination: Logistics, Storage, etc..
- Nonspecific immunization procedures: Bacille Calmette-Guérin (BCG); Oral Polio Virus
- Second-generation vaccines?: Cell immune response

The impact of SARS-CoV-2 mutations ?

- **Overall low rate of mutations**
- **Several variants of concerns:**
  - **B117: the "UK"**
  - **B1351: the "South African"**
  - **P!: the "Brazilain"**
  - **California, NY others…**
- **No demonstrated impact on infection severity?**
- **Enhanced contagiousness: D614G, N501Y(UK; South African? Brazilian?)**
- **Impact on Neutralization capacity??**

D614G, N501Y (UK): No

E484K (South African, Brazil): yes; in vivo? (severe COVID19)

SARS-CoV2 transmitted by infected minks and reinfection by humans

The circulating SARS-CoV-2 spike variant N439K maintains fitness while evading antibody-mediated immunity

Emma C. Thomson, et al

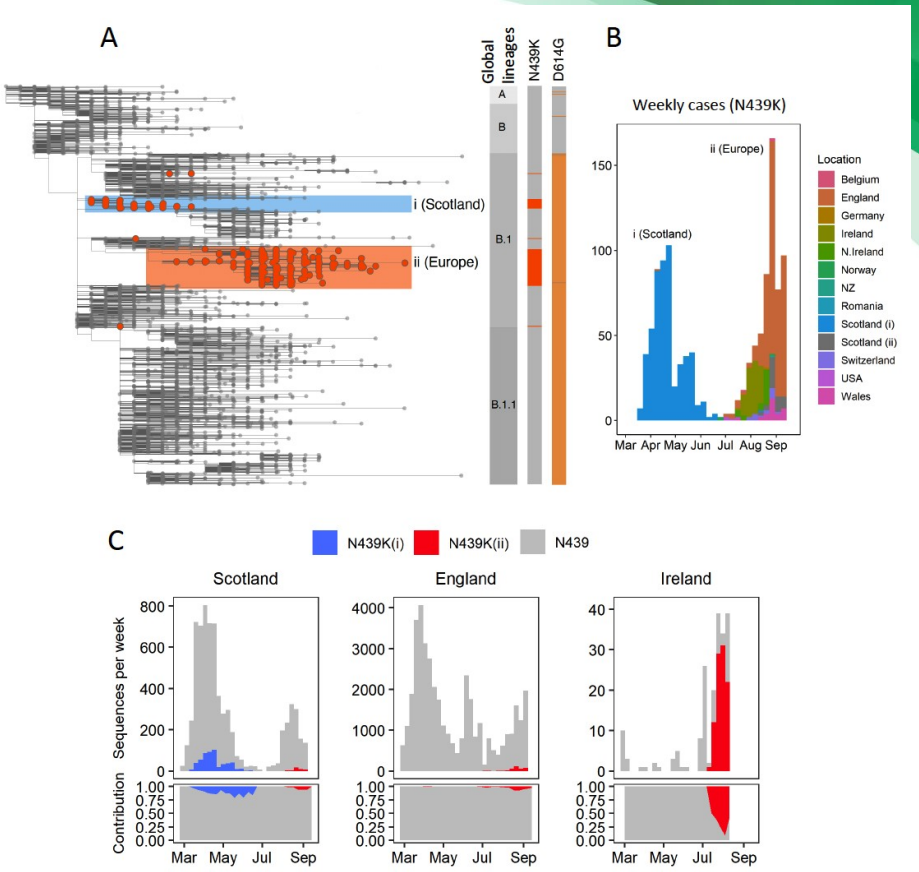


Figure 2. The N439K RBM variant has arisen independently multiple times, twice forming significant lineages

Gastroenterology 2020

Alterations in Gut Microbiota of Patients With COVID-19 During Time of Hospitalization

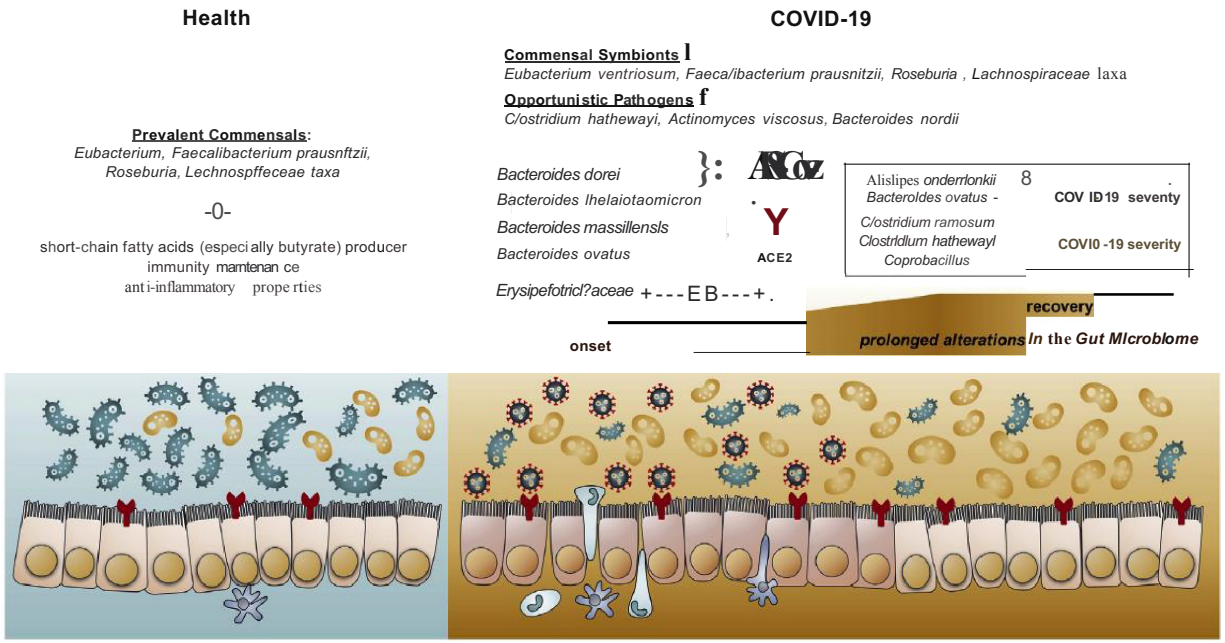


Figure 4. Schematic summary of the gut microbiome alterations in COVID-19. In healthy individuals, *Eubacterium, Faecali bacterium prausnitz.ii, Roseburia,* and Lachnospiraceae taxa are prevalent in their gut microbiome. However, the gut micro biome of patients with COVID-19 is characterized by enrichment of opportunistic pathogens and depletion of commensals in the gut. Such gut dysbiosis persists during the COVID-19 disease course, even after clearance/recovery of SARS-CoV-2 infection. Baseline fecal abundance of the bacteria *Coprobacillus, Clostridium ramosum,* and *Clostridium hathewayi* showed significant correlation with COVID-19 severity, whereas an anti-inflammatory bacterium *Faeca/ib acterium prausnitzii* showed an inverse correlation. Fou r Bacteroidetes members; including *Bacteroides dorei, Bacteroides thetaiotaomicron, Bacteroides massiliensis,* and *Bacteroides ovatus ;* known to downregulate ACE2 expression in the murine gut; showed sig nificant inverse correlation with fecal SARS-CoV-2 viral load in patients withCOVIID-19.

Modulation of gut microbiota with NBT-NM108 for the early treatment of COVID-19 in patients with prediabetes or type 2 diabetes (COVGUT20)

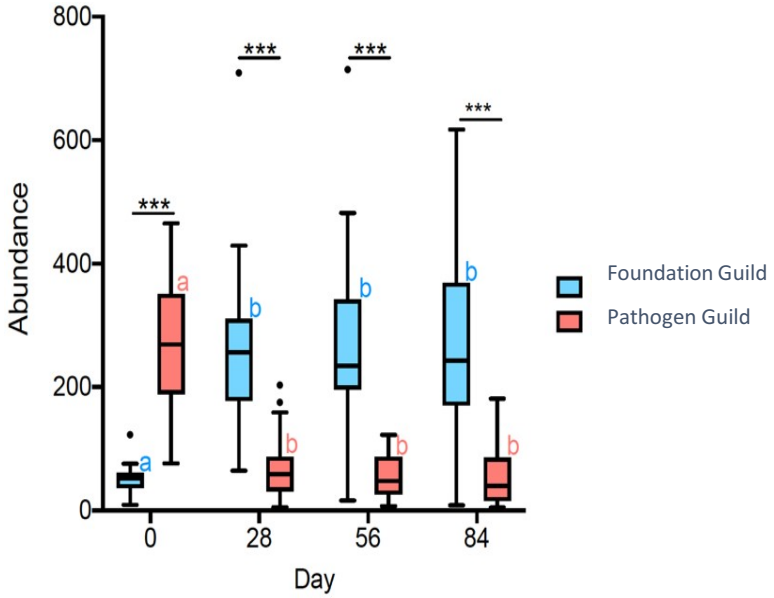
Co-Principal Investigators:

Dr. Asa Oxner (University of South Florida)

Dr. Liping Zhao (Rutgers University)

November 2020

Modulation of Gut Microbiota by NBT-NM108 for the Early Treatment of COVID-19 in Patients with Type 2 Diabetes and Prediabetes



NBT-NM108 (Investigational New Drug)

↓

Promotion of Acetate and butyrate producers

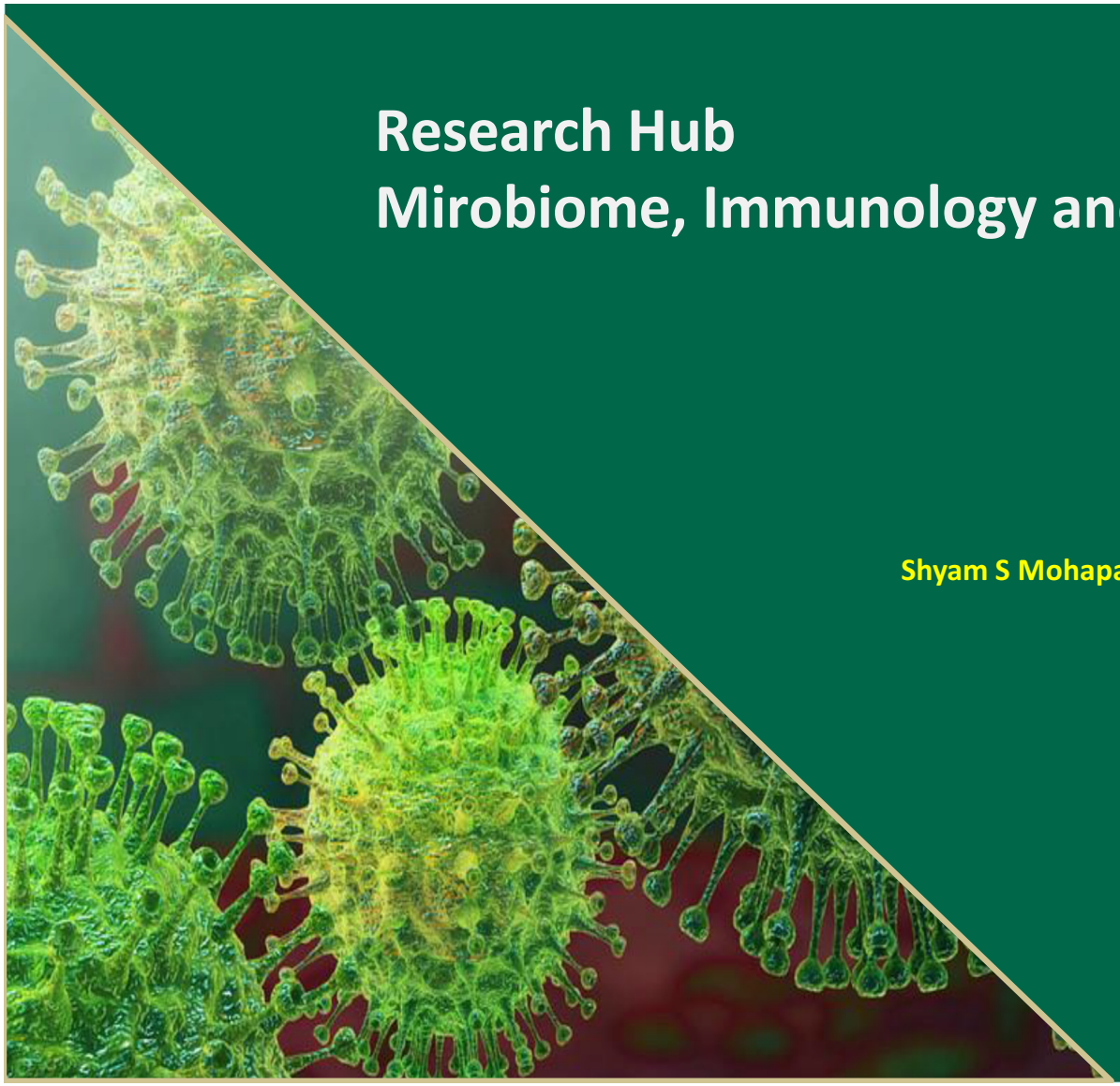
- **Improve glycemic control**
- **Suppress opportunistic pathogens**
- **Boost antiviral immunity**

↓

Reduce the severity of COVID-19-related illness

Study design

- Two-armed randomized controlled trial
  - Intervention group: take NBT-NM108 in the form of drinks 4 times a day for 28 days; follow up for another 28 days.
  - Control group: drink 500 ml of water 4 times a day for 28 days; follow up for another 28 days.
- n = 100, home-based intervention
  - Intervention group N=50,
  - Control group N=50

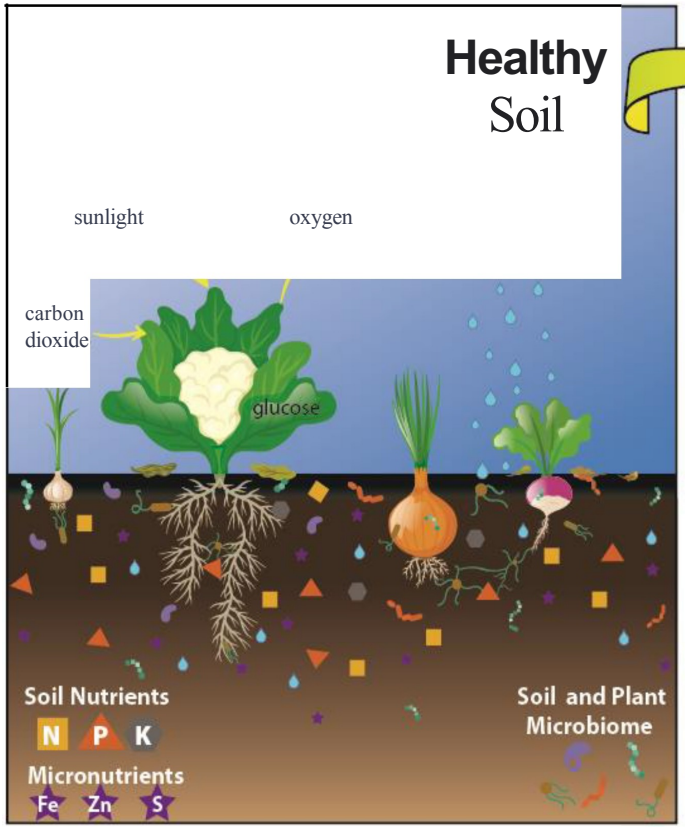


Research Hub
Mirobiome, Immunology and Infection Mitigation

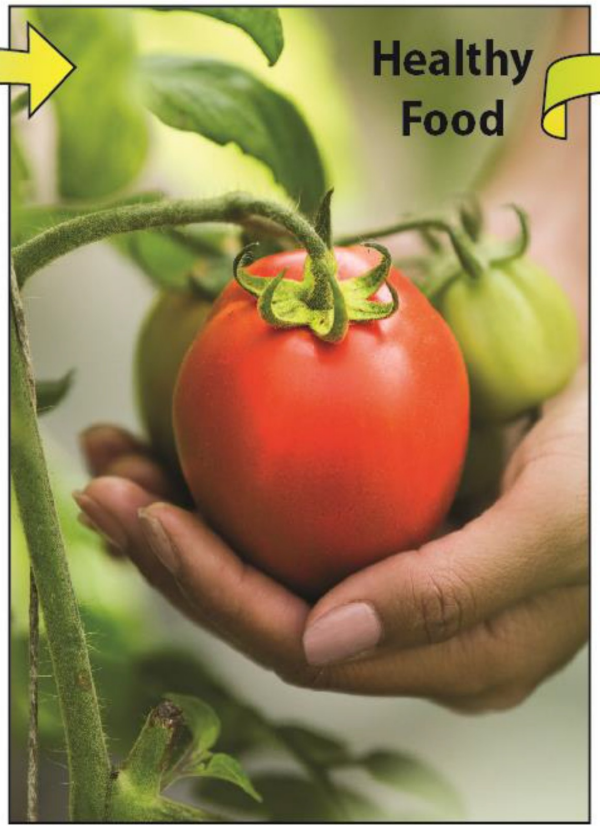
Leaders:
Christian Brechot, USF Health;
and
Shyam S Mohapatra, Morsani College of Medicine and Taneja College of Pharmacy

UNIVERSITY of SOUTH FLORIDA

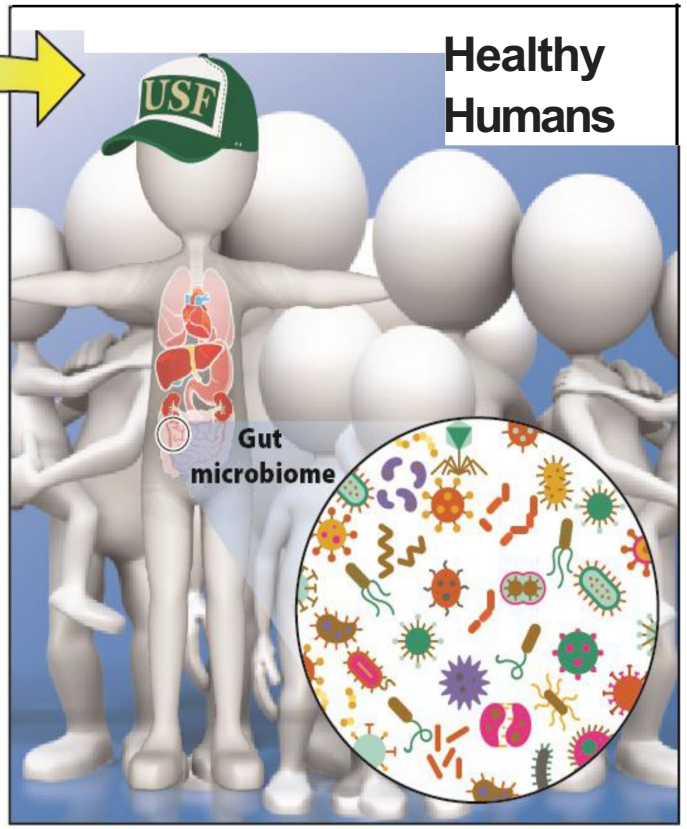

UNIVERSITY OF SOUTH FLORIDA TAMPA BAY METROPOLITAN FOOD PARK (USF-MFP)



Food production



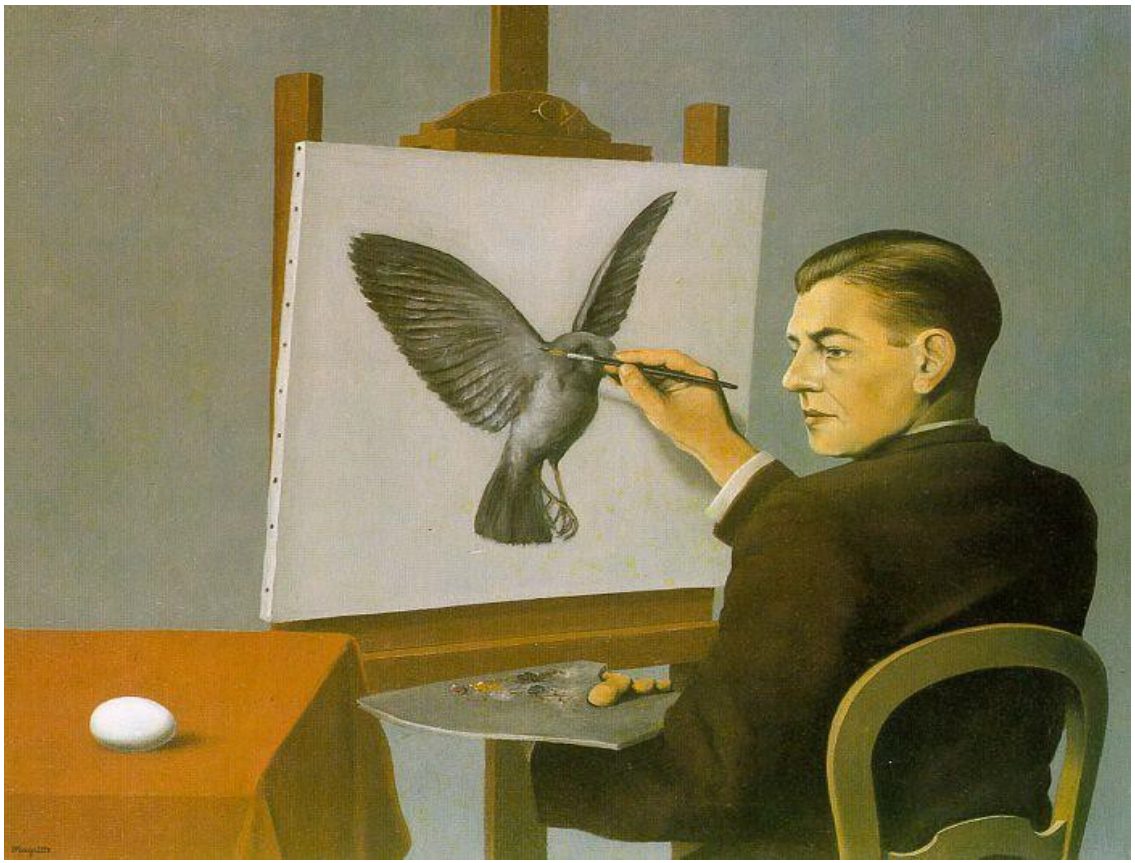
Harvest and distribution



Food consumption

How can we translate the progress to Global and One health?

The role of Global Virus Network



Programs & Initiatives

RESEARCH

- Hepatitis B Database
- Joint Grant Applications
- Annual Meetings
- Regional Meetings
- Zika Serum Bank
- Chikungunya Task Force
- Anticipation & Preparedness Task Force &Virus Watch Group
- HTLV-1 Task Force
- Zika Task Force
- SARS-CoV-2 Task Force
- SARS-CoV-2 Biobank

TRAINING AND EDUCATION

- GVN Short Course
- Hepatitis C Provider Training
- GVN Regional Chapters
- GVN Academy
- GVN Postdoctoral Fellowship
- GVN Online Medical Virology Class
- GVN Microbiome & Viral Infection Online Course

ADVOCACY, PUBLIC EDUCATION AND COMMUNICATIONS

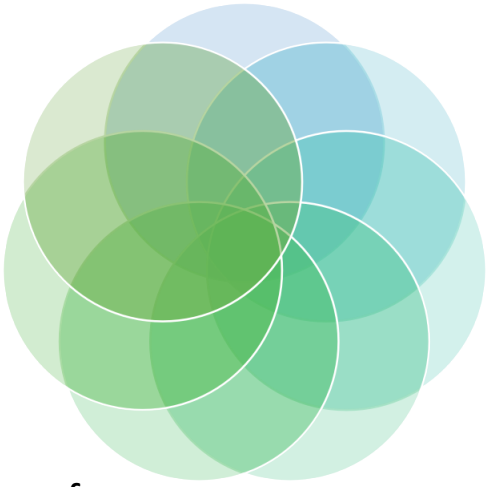
- Ebola FAQs
- GVN Intranet
- Forefront COVID-19 Online Seminars
- GVN Viral Infection Preparedness Education and Resilience (VIPER) Advisory Group
- GVN Perspectives
- Weekly GVN Newsletter
- Press releases and Op-eds

GVN SARS-CoV-2 Activities

Dr. Brechot's Health and Care Blog

Biobanking Projec

SARS-CoV-2 Task Force



Research & Clinical Trials

GVN SARS-CoV-2 Perspectives

GVN: Forefront of Virology COVID-19 Webinar Series

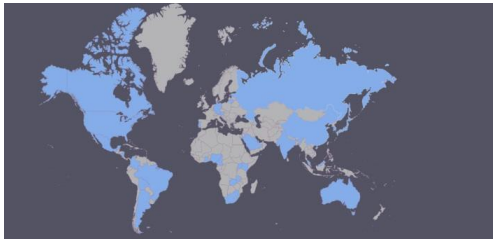
GVN Center and Member Spotlights

COVID-19: GVN CoEs Scientific Collaboration Highlights

- SARS-CoV-2 Task Force
  - Representatives from 30 GVN centers in 12 countries.
  - Meet virtually biweekly-monthly to share the most recent and advanced research findings, and to discuss developments in diagnostic, serological tests, and vaccines
- Distributed Biobanking Project
  - Participants from 16 CoEs
  - Contain the results of genome sequence and immunological analyses and clinical data (i.e., sample type, collection date and location, patient disease status, and prior exposure and treatment history).
- Research & Clinical Trials
  - Translate research into practical applications to improve diagnostics, disinfectants and effective therapy and to develop vaccines

GVN Short Course for Emerging leaders in Virology

- Partner with John Hopkins University, National Institutes of Health and University of Maryland
- 1-week intensive course designed to address the need in trained virologists
- To broaden the skill sets and knowledge bases of junior scientists
- Trained a total of 90 scientists from around the world in the past 6 years.



JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

INSTITUTE OF HUMAN VIROLOGY

UNIVERSITY of MARYLAND THE FOUNDING CAMPUS

NIH

GVN Academy Program

- **YOUNG RISING STAR**
  - To expand GVN's alumni group of emerging virologists with a view toward creating and nurturing a community of virology scholars for the future
  - To provide personalized mentorship and guidance to junior virologists
  - To broaden skills sets and knowledge bases for junior and mid-level scientists and physicians working on virology or potentially interested in the field
  - To grow the next generation of global leaders in virology
  - To provide guidance to increase entrepreneurship

COVID-19: GVN Industry Partners Highlights

- GVN supports the development of vaccines, therapeutics and disinfectants by coordinating research programs between the industrial partners and academia.
- Research projects and Clinical trials with many corporations
  - Regeneron
  - Abbott
  - Sanofi
  - Pfizer
  - Nektar

COVID-19: GVN Public Education

GVN: AN information hub for the dissemination and sharing of COVID-19 updates for scientists and the general public

- GVN SARS-CoV-2 Perspectives
  - GVN scientific column about the latest scientific progress surrounding SARS-CoV-2.
  - To date, 21 posts

- GVN: Forefront of Virology COVID-19 Webinar Series
  - COVID-19 related science sharing, featuring expert virologists from GVN CoEs around the world.
  - To date: 7 seminars
  - **Next Seminar:** 8am EDT, December 3, 2020

Presenter: Dr. Yiming Shao
Chief Expert on AIDS, Chinese Center for Disease Control and Prevention
Director of the Division of Research on Virology and Immunology,
National Center for AIDS/STD Control and Prevention, China

COVID-19: GVN Public Education Continue

- Dr. Brechot's Health and Care Blog
  - Continuously updated resource by Dr. Brechot for novel insights into the current pandemic. To date: 23 posts
- GVN Weekly Brief
  - Distribute the new insights of COVID-19 to the GVN scientists and the general public
- GVN Center and Member Spotlights
  - Highlight of our prominent GVN scientists are working on to curb the pandemic. To date, 22 posts
- Global Health Conversation Series with USF Health International

GVN & USF Online Course: Microbiomes and their Impact on Viral Infections

- World-renowned Speakers
- 2 certificated noncredit courses
  - Introduction on the Microbiomes, 11 modules
  - Symbiotic Evolutions in the Microbiome World, 9 modules
- Self-paced, Online format

GVN GLOBAL VIRUS NETWORK

USF Initiative on MICROBIOMES

UNIVERSITY OF SOUTH FLORIDA

Expert Speakers From Around the World

JACQUES RAVEL, PHD
Professor, Microbiology and Immunology
Associate Director, Institute for Genome Sciences
Associate Director for Genomics, Institute for Genome Sciences
University of Maryland School of Medicine

LARRY DISHAW, PHD
Associate Professor, College of Medicine Pediatrics, Assistant Professor, College of Medicine Molecular Medicine
University of South Florida

SARKIS K. MAZMANIAN, PHD
Luis & Nelly Soux Professor of Microbiology
Investigator, Heritage Medical Research Institute
Division of Biology and Biological Engineering
California Institute of Technology

CAMILO ZALAMEA, PHD
Assistant Professor, Department of Integrative Biology
University of South Florida

KARINE CLÉMENT, MD, PHD
Sorbonne University, INSERM UMRS NutriOmics, *Faculty of Medicine*

BENOIT CHASSAING, PHD
Team Leader
Mucosal Microbiota in Chronic Inflammatory Diseases
INSERM U1016

JOHN E. PARKINSON, PHD
Assistant Professor, Department of Integrative Biology
University of South Florida

LAURENCE ZITVOGEL, MD, PHD
Group Leader, Tumour Immunology and Immunotherapy of Cancer
Institut Gustave Roussy
European Academy of Tumor Immunology

MYA BREITBART, PHD
Professor, College of Marine Science
University of South Florida

MARIA CARLA SALEH, PHD
Principal Investigator, Viruses and RNAi Unit
Department of Virology, Institut Pasteur Paris

SARAH E. CLARK, PHD
Assistant Professor, Department of Otolaryngology
University of Colorado School of Medicine

RAMESH AKKINA, DVM, PHD
Professor, Department of Microbiology, Immunology and Pathology
Colorado State University

NICHOLE KLATT, PHD
Professor
Director, Surgical Outcomes and Precision Medicine Research Division
University of Minnesota Medical School and Department of Surgery

MATHILDE GENDRIN, PHD
Junior Group Leader, Microbiota of Insect Vectors Group
Institut Pasteur de la Guyane

MAUREEN GROER, PHD, RN, FAAAN
Gordon Keller Professor, Nursing
Executive Director, Bio-Behavioral Research Laboratory
Professor, College of Nursing
Professor, College of Medicine Internal Medicine
University of South Florida

LIPING ZHAO, PHD
Professor
Eveleigh-Fenton Chair of Applied Microbiology
Department of Biochemistry and Microbiology
School of Environmental and Biological Sciences
Rutgers University

COVID-19: GVN Advocacy & Communication

- GVN serves as a world-wide resource to governments and international organizations seeking advice regarding the current COVID-19 outbreak as well as other viral disease threats, prevention and response strategies, research and training on viral infections.

- 2020 Year to Date: GVN has been featured in
  - 106 News Articles
  - 28 TV Appearances
  - 10 Radio Appearances

THANKS
Linman Li
USF Friends
All GVN Friends

Please contact Christian Brechot cbrechot@usf.edu or Linman Li at linman1@usf.edu for any questions.

USF Health

GVN
GLOBAL VIRUS NETWORK

USF Initiative on
MICROBIOMES

www.webbertraining.com/schedulep1.php

April 21, 2021	*(South Pacific Teleclass)* **RETURNING TO WORK DURING COVID-19** Speaker: **Crystal Polson**, University of Melbourne, Australia
April 27, 2021	*(FREE European Teleclass ... Denver Russell Memorial Teleclass Lecture)* **HYGIENE BEHAVIOUR IN OUR HOMES AND EVERYDAY LIVES TO MEET 21ST CENTURY NEEDS** Speaker: **Prof. Sally Bloomfield**, International Scientific Forum on Home Hygiene, UK
May 5, 2021	*(FREE WHO Teleclass for May 5 Events)* **SECONDS SAVE LIVES: CLEAN YOUR HANDS** Speaker: **Prof. Didier Pittet**, University of Geneva Hospitals, Switzerland
May 11, 2021	*(European Teleclass)* **THE NORWAY EXPERIENCE CONTROLLING THE CORONAVIRUS PANDEMIC** Speaker: **Prof. Bjørg Marit Andersen**, Faculty of Health and Social Science, Department of Nursing and Health Science, University of South-Eastern Norway

Thanks to Teleclass Education

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who.int/infection-prevention/en