Session 9

Antibody Content In Plasma: Bridging The Present And The Future

1- Marion Lanteri:
Creative Testing Solutions
USA

Role of Hyperimmune IVIg/IgG, Convalescent Plasma, and New Technologies in Future Pandemics

2- David Sullivan:
Johns Hopkins
USA

Lessons from COVID-19 Convalescent Plasma for Future Emerging Infectious Diseases

3- Sheila Keating:
Grifols Diagnostics
USA

Next Generation of Antibody Therapeutics for Treating Infectious Diseases

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Role of Hyperimmune IVIg/IgG, Convalescent Plasma, and New Technologies in Future Pandemics

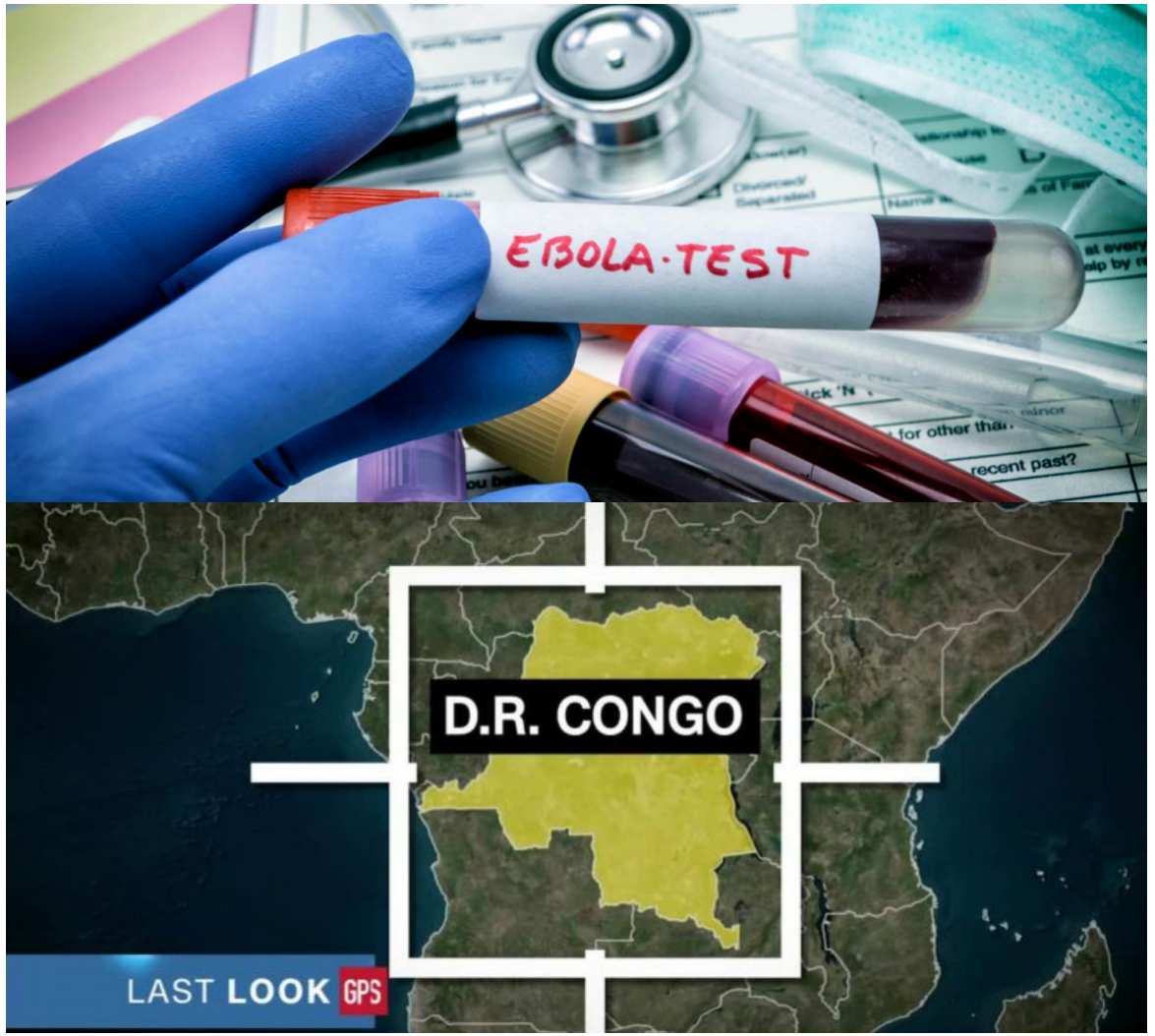
Lessons learned from COVID-19 - *Are we ready for the next pandemic?*

Marion C. Lanteri, PhD,
Vice President, Scientific Affairs
Creative Testing Solutions, USA

32nd IPFA/PEI International Workshop on Surveillance and Screening of Blood-borne Pathogens

Emerging Respiratory Disease: Hantavirus (*Andes*)

Outbreak News: Ebola Virus (*Bundibugyo*)



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Lesson #1

No Vaccine, No Drug, No Diagnostic Test

Antibodies work!!!

Sources of Antibodies?

- Plasma-derived:

Plasma from healthy donors

↓

Hyperimmune IVIg

➢ **IgG concentration varies depending on health status, past and recent infections, vaccines**

Optimized plasma collection from recently infected or vaccinated donors

Enriching in specific IgG

Plasma from convalescent donors

Plasma from vaccinated donors

↓

Hyperimmune IgG

→ Hyperimmune IVIg enriched in specific IgG

Sources of Antibodies?

Enriching in specific IgG

- Lab derived:

Monoclonal Antibodies
Polyclonal Antibodies
Recombinant Antibodies

→ Hyperimmune IVIg
enriched in specific IgG

Libraries of antibody producing cells
Proactively produce antibodies
Stockpile

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Lesson #2

When EID Emerge, Time is of the Essence

Timeline of availability

- Plasma-derived:

Plasma from convalescent donors

Readily available if you can identify convalescent donors

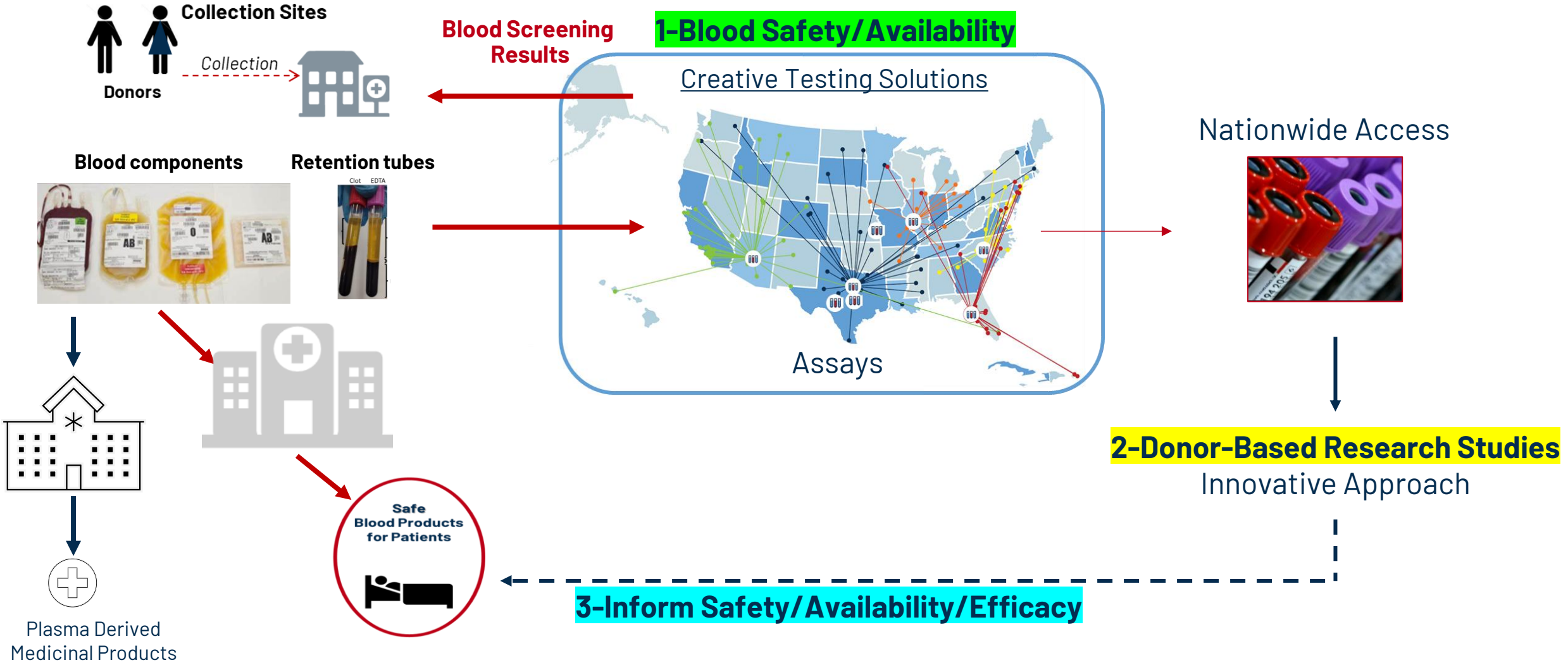
Manufacturing

Hyperimmune IgG

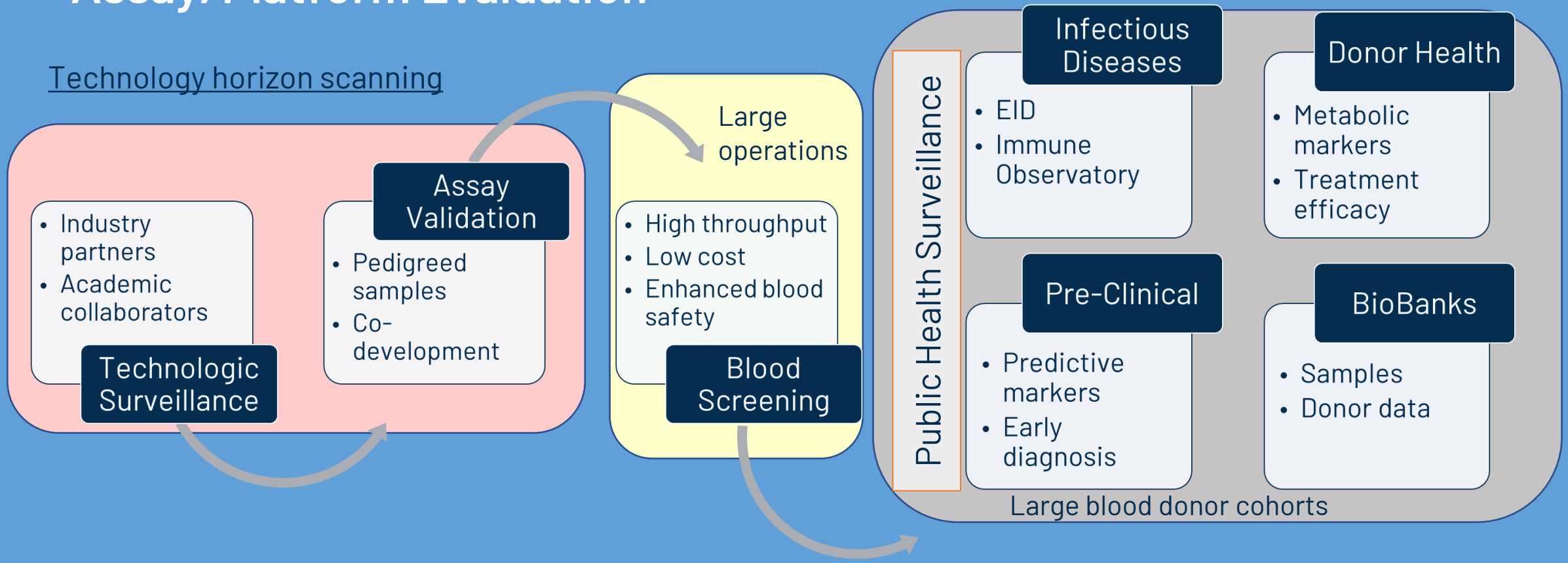
Hyperimmune IVIg
enriched in specific IgG

Blood and Plasma Screening at Creative Testing Solutions

A unique infrastructure for blood safety and research



Assay/Platform Evaluation



- ✓ **Regulatory Approvals**
- ✓ **Blood /Plasma Safety, Availability, Efficacy**
- ✓ **Rapid Response to EID – Public Health Surveillance to Inform Policies**

Screening at Creative Testing Solutions

Blood Screening

Marker	Test	Vendor	System
Classic Agents	**HIV/HCV/HBV NAT**	Grifols	Panther
	Anti-HIV-1/2 Combo	Abbott	Alinity s
	Anti-HCV	Abbott	Alinity s
	Anti-HBc	Abbott	Alinity s
	HBsAg	Abbott	Alinity s
	Anti-HTLV-I/II	Abbott	Alinity s
	CMV	Fujirebio	PK7400
	Syphilis	New Market Bio.	PK7400
	Syphilis RPR	Arlington	ASI
Vector-Borne Agents	**WNV NAT**	Grifols	Panther
	***Babesia* species NAT**	Grifols	Panther
	Anti-*T. cruzi*	Abbott	Alinity s
Blood Typing	**ABO/Rh**	Diagast	PK7400
	HLA Class I and II	Immucor GTI	Gemini
	RBC Antibody Screen	Immucor	Neo Iris
	Antibody Identification	QuidelOrtho	Vision
Donor Health	**Triglyceride**	Beckman Coulter	AU680
	A1C	Abbott	Alinity c
	Ferritin	Beckman Coulter	AU680

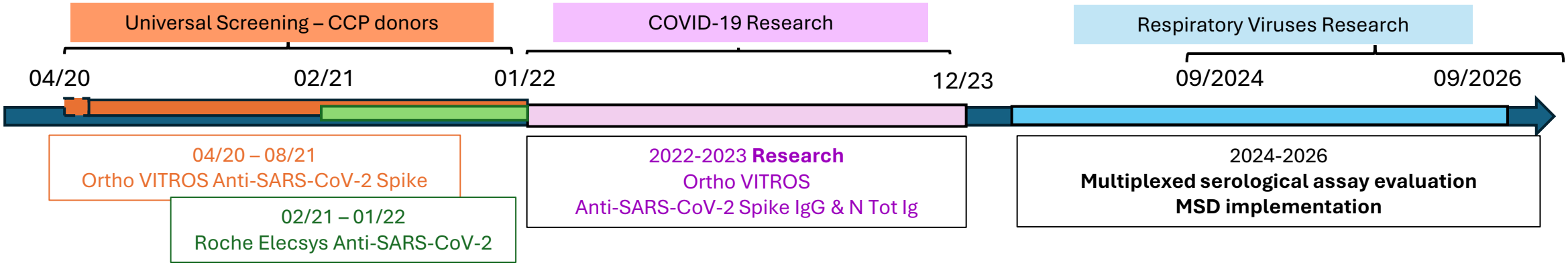
Plasma Screening

Marker	Test	Vendor	System
Classic Agents	**HIV/HCV/HBV NAT**	Grifols	Panther
	Anti-HIV-1/2 Combo	Abbott	Alinity s
	Anti-HCV	Abbott	Alinity s
	HBsAg	Abbott	Alinity s
	Syphilis RPR	Arlington	ASI
	HAV/B19 NAT	Grifols	Panther
	HAV/B19 NAT (recovered)	Roche	c6800
Donor Health	***Serum Protein***	*Sebia*	*Capillarys*
	ALT	Abbott	Alinity c
	Lp(a)	Abbott	Alinity c

Rapid implementation of SARS-CoV-2 serological assays :

- To support the identification of CCP donors
- To enable epidemiology studies to monitor infections
- Blood donors are ideal for public health surveillance

Assays are needed to maintain blood/blood product availability



CTS Operations:

- Anti-S screening to identify CCP donors
- Anti-N screening to identify infected CCP donors
- CCP demand decreased
- Testing was discontinued

⇩

Enabled CCP availability

CTS R&D:

- Maintained SARS-CoV-2 serological assays
- Donor-based research
- Expanded approach to other respiratory viruses
- For public health surveillance with CDC

⇩

→ Rapid response to the next EID

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Lesson #3

Rapid Responses to EID Require Laboratory Infrastructure Assays, Samples, & Research Capacity

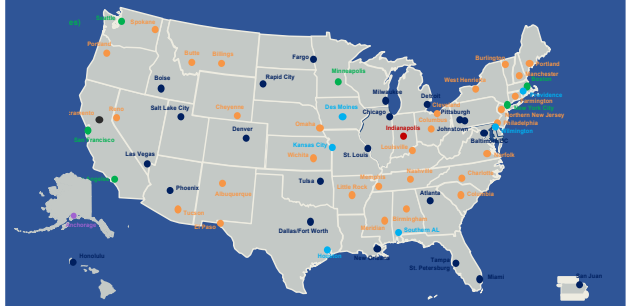
Responding to the SARS-CoV-2 evolving pandemic… Extending the approach to other respiratory viruses

NBDS Cross Sectional Donor Serosurveillance

Q2 2020-Q4 2021

~152,000 monthly donations, 17 BCOs

Track infections
Vaccinations
Hybrid Immunity

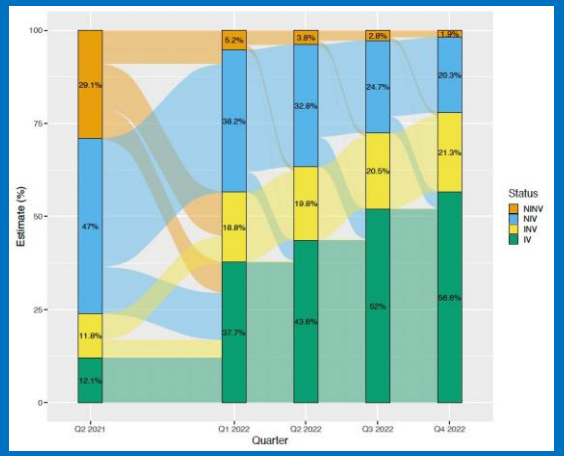


NBDC Longitudinal Donor Cohort Program

Q2 2021-Q4 2022

~142,ooo routine donors

Vx breakthrough and reinfections, Vx effectiveness, correlates of protection, impact of VoC, surveys

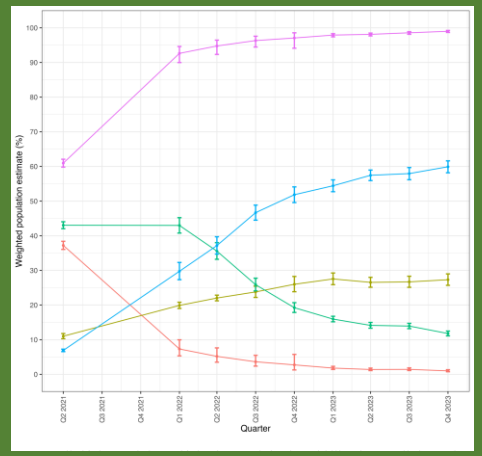


2023 Repeat Donor Cohort Program

Q1 2023-Q4 2023

~46,000 informative donors

Self-funded ongoing sample and survey data acquisition, real time quarterly testing

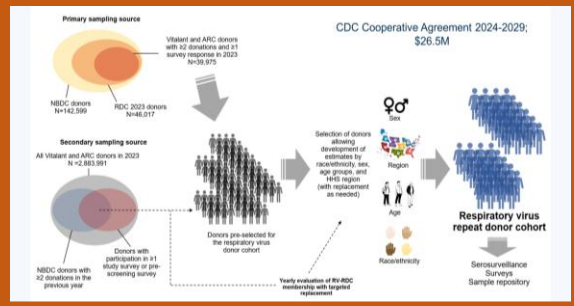


Respiratory Virus Repeat Donor Cohort Program

Q3 2024-Q2 2029

~30,000 donors

~10,000 donations real-time tested quarterly for 10 RV antigens
Capacity to add emerging RVs



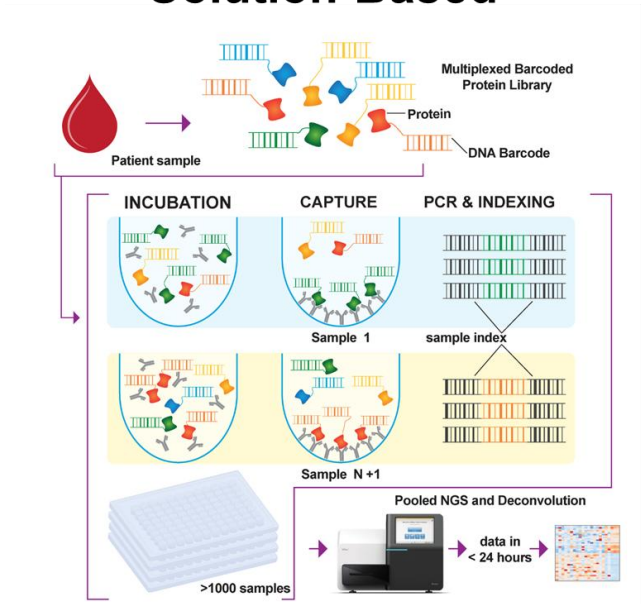
SARS-CoV-2 variants

+RSV, hMPV, Flu, hPIV

Evaluation of Multiplexed Serological Assays

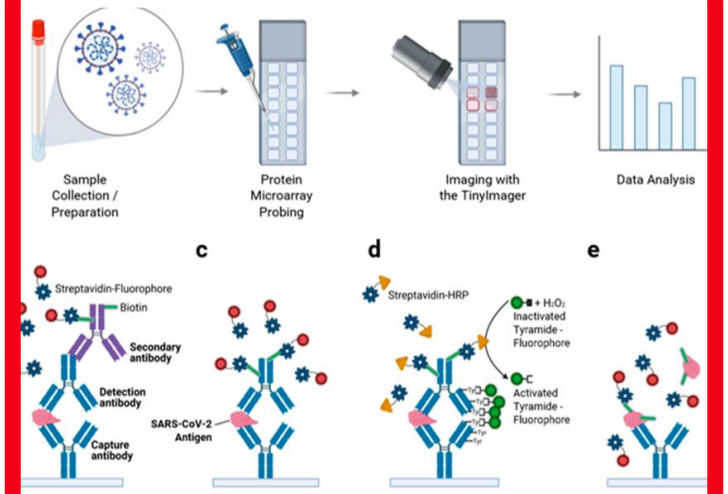
Performance and rapid repurposing for response to EID

Solution-Based



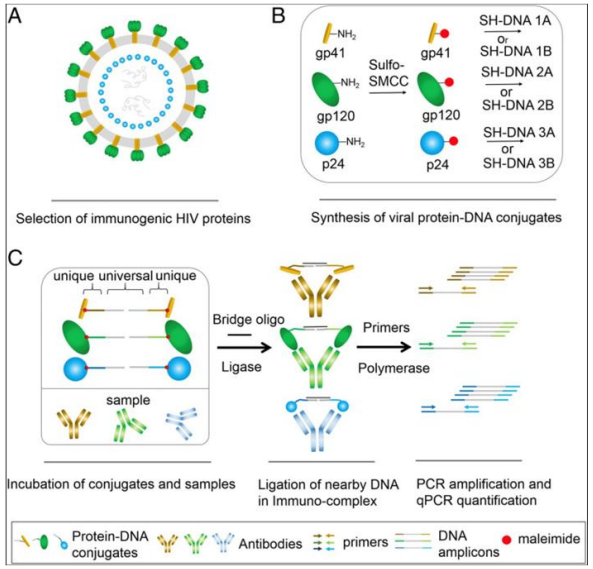
- Multiplex In-solution Protein Array (MISPA) - **Gila Diagnostics**
- Molecular indexing of protein self assembling (MIPSA) - **Infinity Bio**

Plate-Based



- COVAM - **UC Irvine**
- V-Plex - **Meso Scale Discovery (MSD)**

PCR-Based



- Antibody Detection by Agglutination-PCR (ADAP) – **Enable Biosciences**

200 antigens
2,000 samples per run
3-6 logs of dynamic range

***10-30 antigens, 16-74 samples per run*, 3-6 logs of dynamic range**

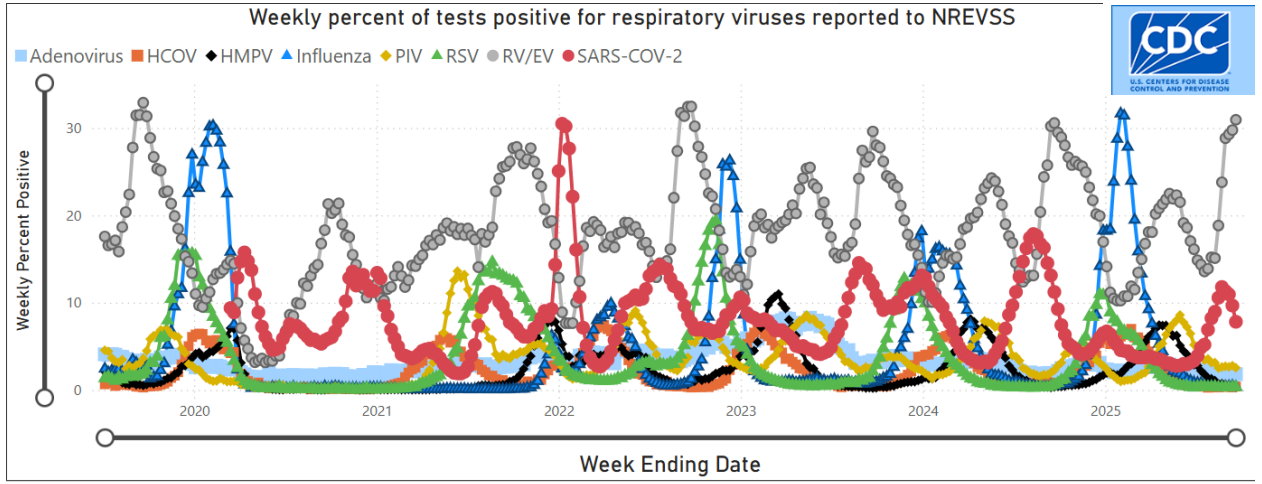
Respiratory Virus-Repeat Donor Cohort Program Goals

MesoScaleDiscovery
Custom-made assay

Respiratory Panel 5-CoV-2 Prototype			
Spot	**Antigen Type**	**Antigen**	**Assay Name**
1	CoV-2 Spike	SARS-CoV-2 Spike	CoV-2 Spike
2	Influenza	Flu A/Wisconsin/67/2022 H1	H1/Wisconsin/22
3	Metapneumovirus	hMPV F	hMPV F
4	Influenza	Flu A/DC/27/2023 H3	H3/DC/23
5	CoV-2 Nucleocapsid	SARS-CoV-2 N	CoV-2 N
6	Parainfluenza	hPIV (1-2) F	hPIV (1-2) F
7	RSV	RSV Pre-Fusion F	RSV Pre-F
8	Parainfluenza	hPIV3 F	hPIV3 F
9	Influenza	Flu B/Austria/2021 HA	B/Austria/21
10	CoV-2 Spike	SARS-CoV-2 Spike (LP.8.1)	CoV-2 Spike (LP.8.1)

- SARS-CoV-2
- Respiratory Syncytial Virus
- Influenza (2A, 1B)
- Metapneumovirus
- Parainfluenza 1/2-3

Monitor	Estimate	Assess
Infections	Population weighted incidence	Immunity
Reinfections	Infections	Risk of infection
Vaccination events	Reinfections	Antibody titers
	Nationally	



+ Emerging Respiratory Viruses of Public Health Interest

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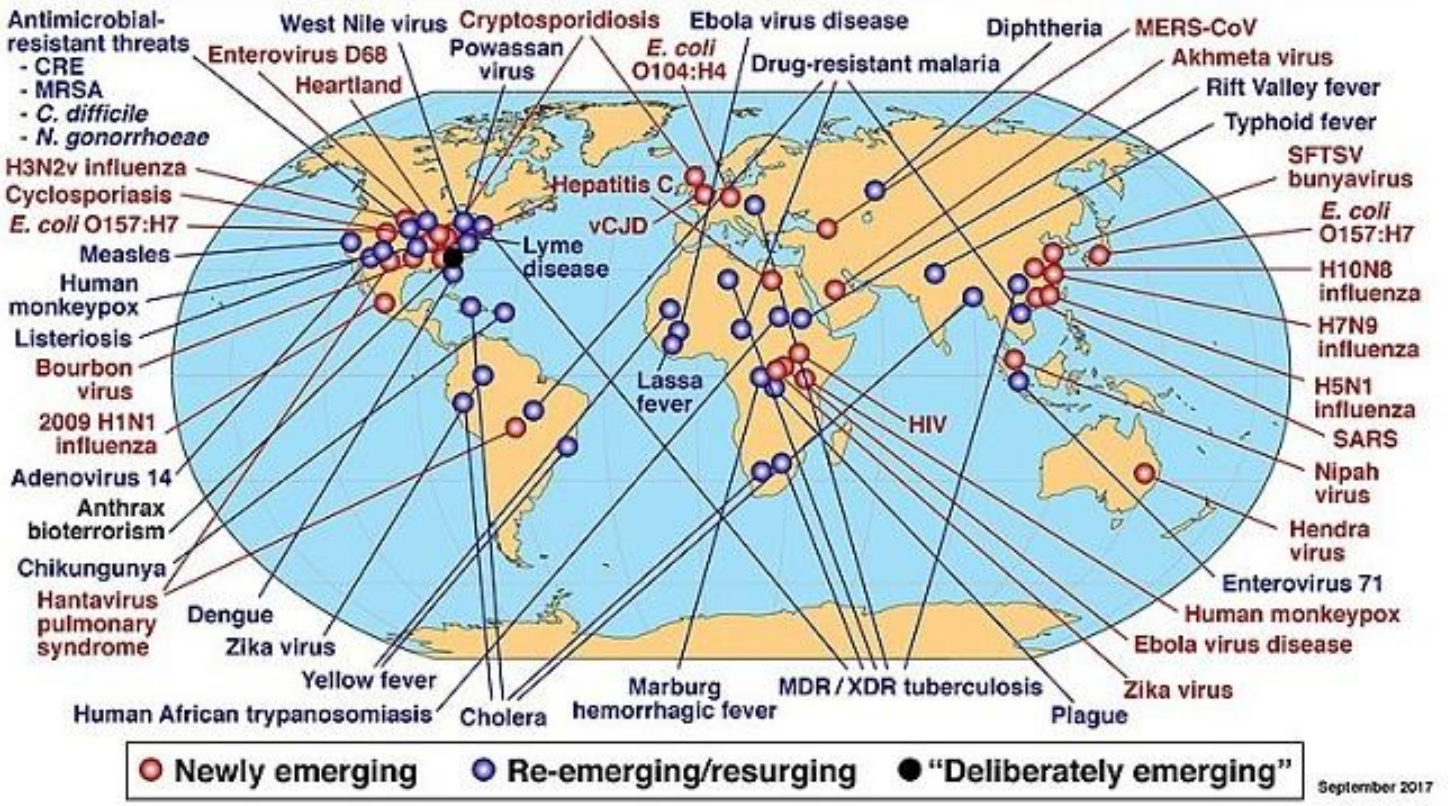
Lesson #4
Can we predict the next EID?

WNV, DENV, CHIKV, ZIKV, Babesia, SARS-CoV-2, OROV, H5N1…

Responding to Global Emergences

Can we predict which one will emerge next?



Proactive surveillance may help!!!

Proactive surveillance

OneHealth Applied to Emerging Infectious Diseases

Sample EID *Hotspots* → Perform Pathogen Discovery → Characterize Risk

Human, animal, and environmental interface

INFECTIOUS DISEASES

The Global Virome Project

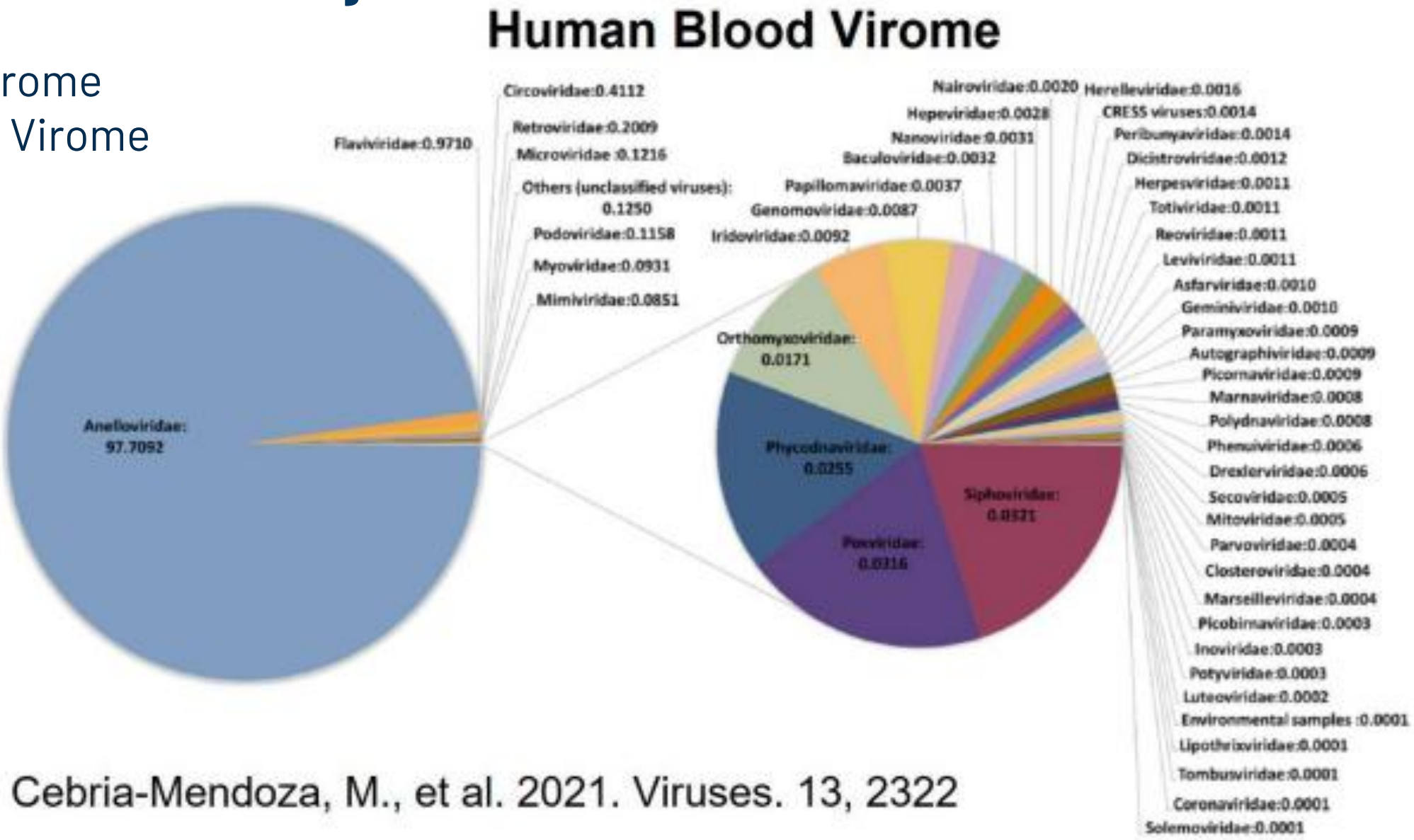
Expanded viral discovery can improve mitigation

viruses. The Global Virome Project aims to identify and characterize the majority of currently unknown viruses in key wildlife groups, including rodents, nonhuman primates, and bats.

By **Dennis Carroll, Peter Daszak, Nathan D. Wolfe, George F. Gao, Carlos M. Morel, Subhash Morzaria, Ariel Pablos-Méndez, Oyewale Tomori, Jonna A. K. Mazet**

The Human Virome Project

1. Healthy Virome
2. Unhealthy Virome



Cebria-Mendoza, M., et al. 2021. Viruses. 13, 2322

Multiplexed Assays, OMICS Approaches

Global virome project

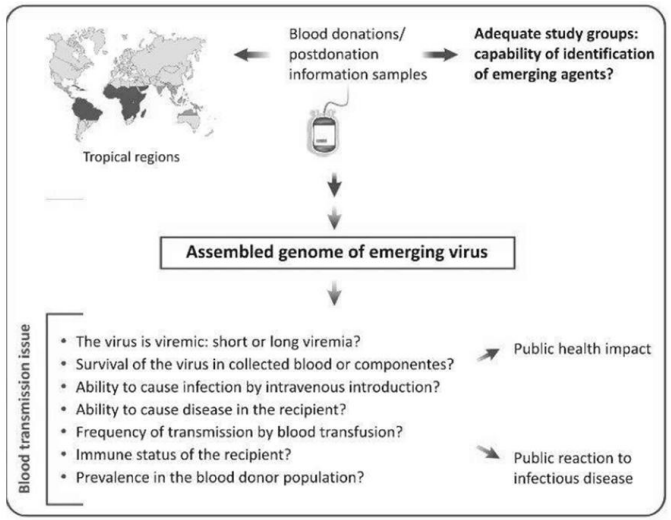
viruses MDPI

Review

Viral Metagenomics for Identification of Emerging Viruses in Transfusion Medicine

Direct detection of known and unknown EID

overview of the viral nucleic acid abundance, also named "blood virome". Detailed characterization of the blood virome of healthy donors could identify unknown(emerging)viral genomes."



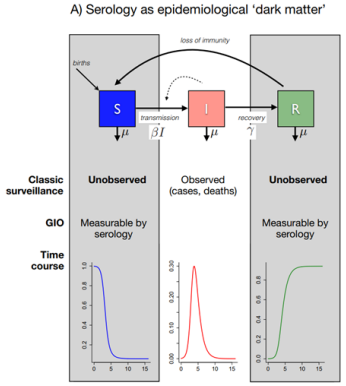
Global Immunological Observatory

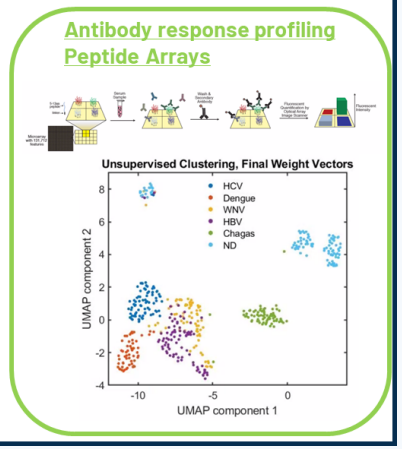
SCIENCE FORUM eLife

A Global Immunological Observatory to meet a time of pandemics

Detecting changes in immunosignatures at population levels

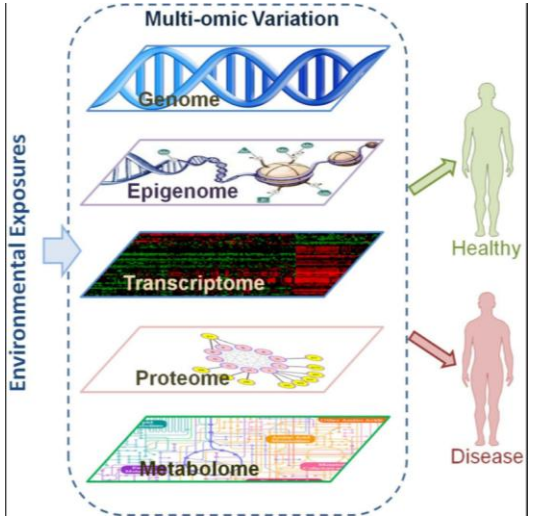
MICHAEL J MINA[†*], C JESSICA E METCALF[†*], ADRIAN B MCDERMOTT, DANIEL C DOUEK, JEREMY FARRAR AND BRYAN T GRENFELL

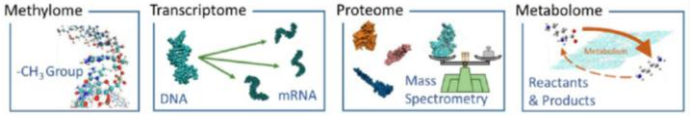




New OMICS tools

Integrative Analysis of Multi-omics Data





Adv. Genet.2016;93:147-90.
Cancer Drug Resist 2019;2:419-27.

Integration of multi-faceted approaches combined with AI powered Systems Analyses will further enhance our agility

CTS

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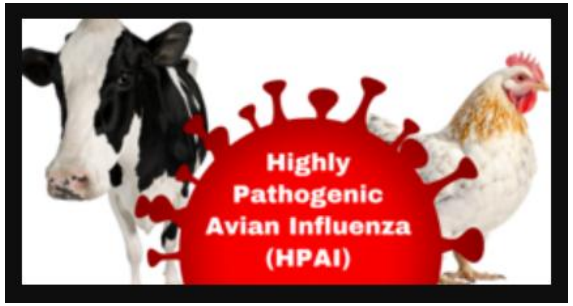
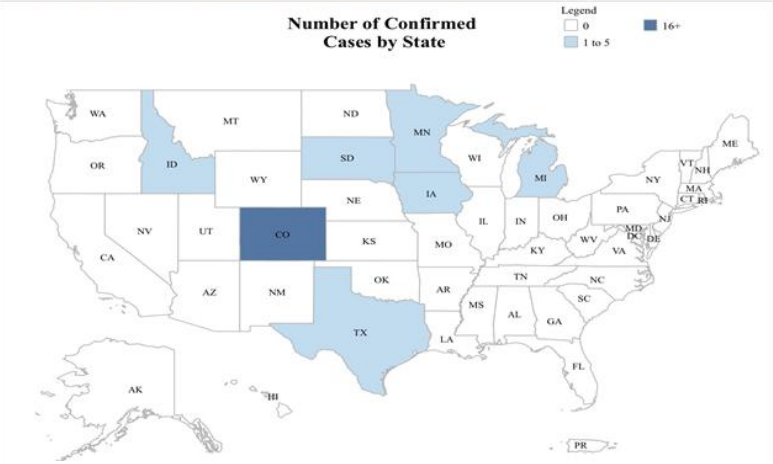
Lesson #5

Now is the time!

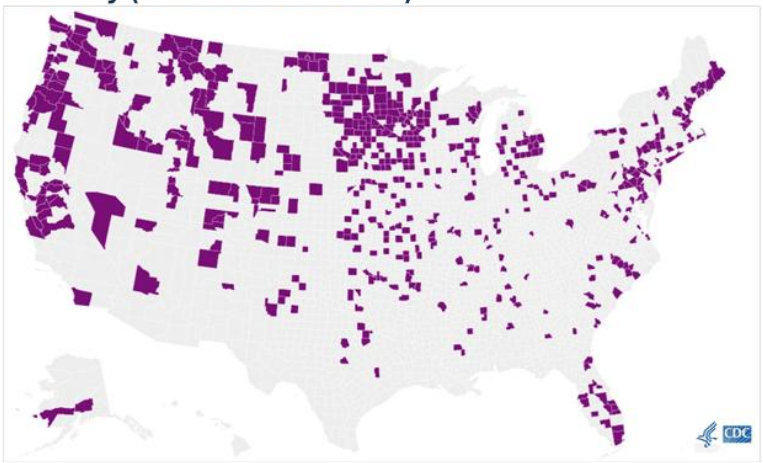


Emerging Respiratory Viruses: H5N1 Influenza and Hantavirus

Dairy cattle (affected states):



Poultry (affected counties):

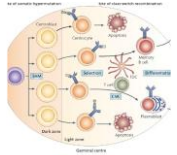


Prepare or react?

Multi-faceted approach according to timeline

Weeks post-infection

7-12 months



3-4 months/Proactive

Convalescent plasma

- Blood and plasma donors
- High Ab titers
- Neutralizing Abs

Blood Collectors

Hyperimmune IVIg

- Plasma donors
- High Ab titers
- Enriched plasma pools

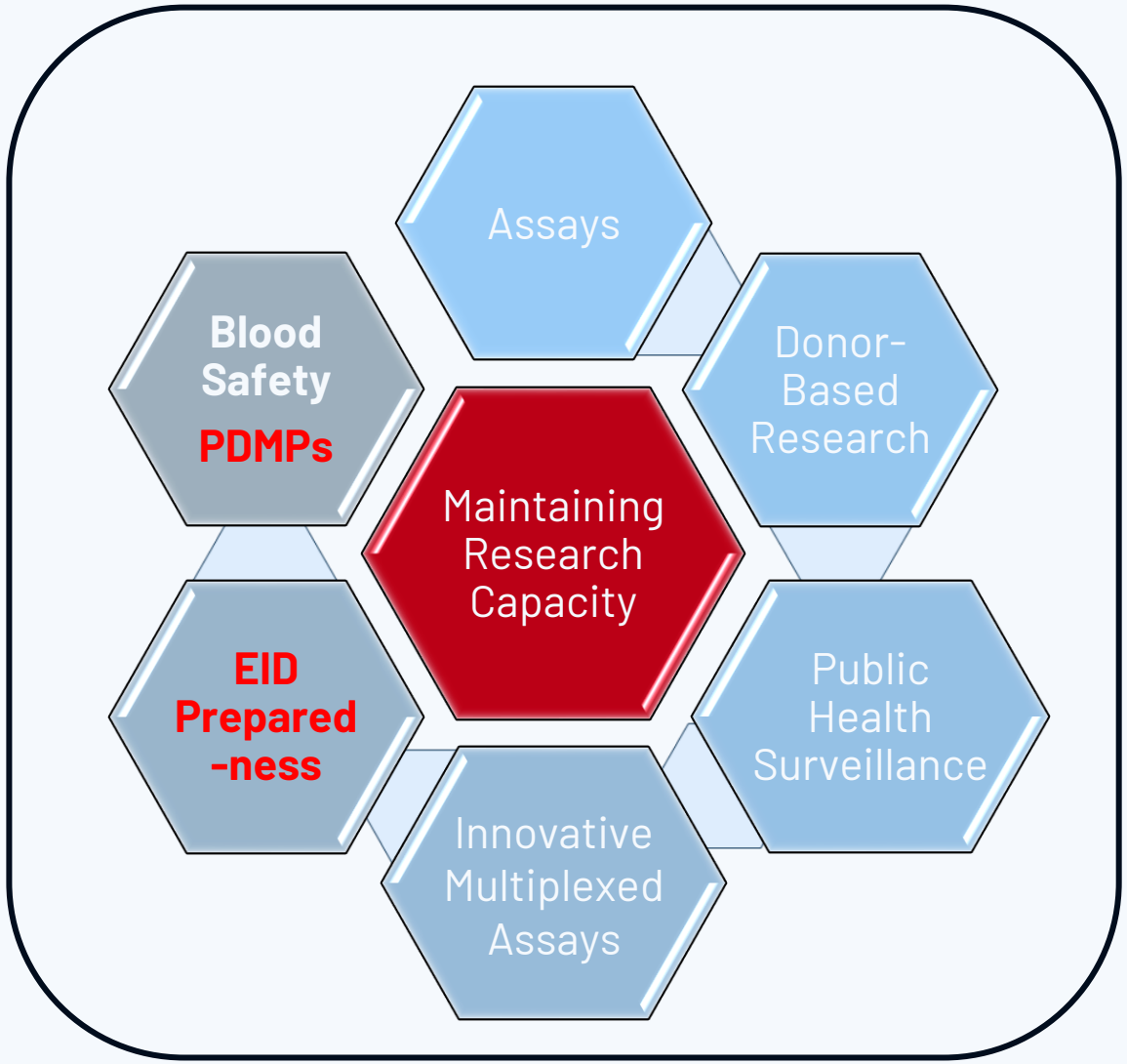
Plasma Collectors

Recombinant Polyclonal

- Plasma donors high Ab titers
- Isolate B cells for hybridomas
- Produce polyclonal Ab

Gigagen

EID Response: Our Strategy?



- Capitalizing on a unique infrastructure for sample capture
- Maintaining testing capacity
- Performing donor-based research

✓To identify EID early

✓To maintain blood safety

✓To inform public health policies

✓To enable faster therapeutic response

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"We can act now to put us in a position so that when the next pandemic does happen, we don't have to allow it to get out of control"

Michael Mina

Creative TESTING SOLUTIONS®

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mlanteri@mycts.org