

Rapid Acceleration of Diagnostics: ***RADx (Tech + ATP)***

Bruce J. Tromberg, Ph.D.

Director, National Institute of Biomedical Imaging and Bioengineering (NIBIB)



RADx Tech & ATP

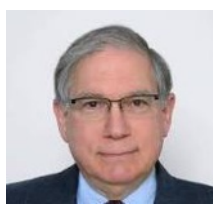
NIH Office of the Director



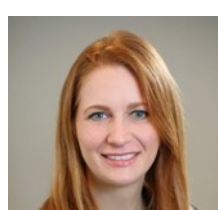
Francis Collins



Rachael Fleurance



Larry Tabak



Tara Schwetz

RADx Tech – \$500M

Highly competitive, rapid three-phase challenge to identify the best candidates for at-home or point-of-care tests for COVID-19

RADx Advanced Technology Platforms (RADx-ATP) – \$230M

Rapid scale-up of advanced technologies to increase rapidity and enhance and validate throughput – create ultra-high throughput machines and facilities

RADx Underserved Populations (RADx-UP) – \$500M

Interlinked community-based demonstration projects focused on implementation strategies to enable and enhance testing of COVID-19 in vulnerable populations

RADx Radical (RADx-Rad) – \$200M

Develop and advance novel, non-traditional approaches or new applications of existing approaches for testing

**April 24, 2020: \$1.5B to NIH
\$500 Million to NIBIB**



Jill Heemskerk



Bruce Tromberg

**National Institute of
Biomedical Imaging and
Bioengineering (NIBIB)**



The NEW ENGLAND
JOURNAL of MEDICINE

Rapid Scaling Up of Covid-19 Diagnostic Testing in the United States — The NIH RADx Initiative

Bruce J. Tromberg, Ph.D., Tara A. Schwetz, Ph.D., Eliseo J. Pérez-Stable, M.D.,
Richard J. Hodes, M.D., Richard P. Woychik, Ph.D., Rick A. Bright, Ph.D.,
Rachael L. Fleurance, Ph.D., and Francis S. Collins, M.D., Ph.D.

The first reports of an unusual cluster of pneumonia cases in the city of Wuhan, China, emerged in December 2019, heralding a global pandemic. As of July 13, 2020, more than 3.3

of RADx and their goals, and we end with a review of the challenges ahead.

On April 24, 2020, Congress appropriated \$1.5 billion, from the \$25 billion provided in the

RADx Tech & ATP

NIH Office of the Director



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**April 24, 2020: \$1.5B to NIH
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April 29



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\$307 M Partnership with BARDA

Tech/ATP Team Leads: Tiffani Lash, Todd Merchak, Taylor Gilliland, Kate Egan, Mike Wolfson, Doug Sheeley, Gene Civillico

NHLBI COAC: Ann Gawalt, Allison Cristman, Kristi Cooper, Shirley Ruiz-Lundgren, Roxane Burkett, Cornelius Moore, Lynn Furtaw, John Lear, Ahmed Hassan, Linda Smith, Natalie Bruning, Stacey Turner, Tara Knox



OASH



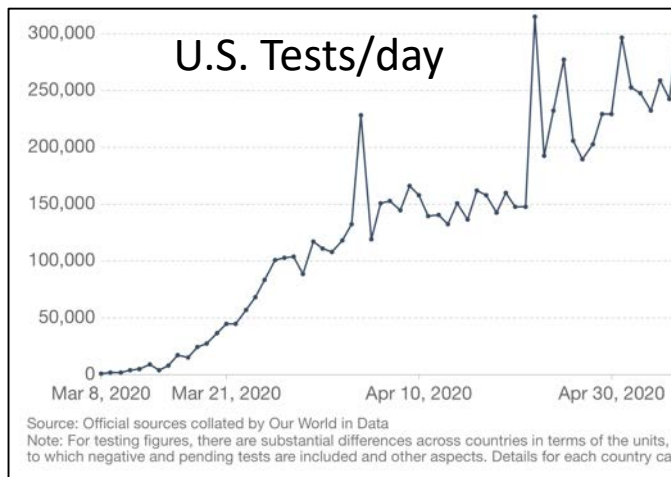
RADx Tech & ATP Goals

1) Expand COVID-19 Testing Technologies: *Number, Type and Access*

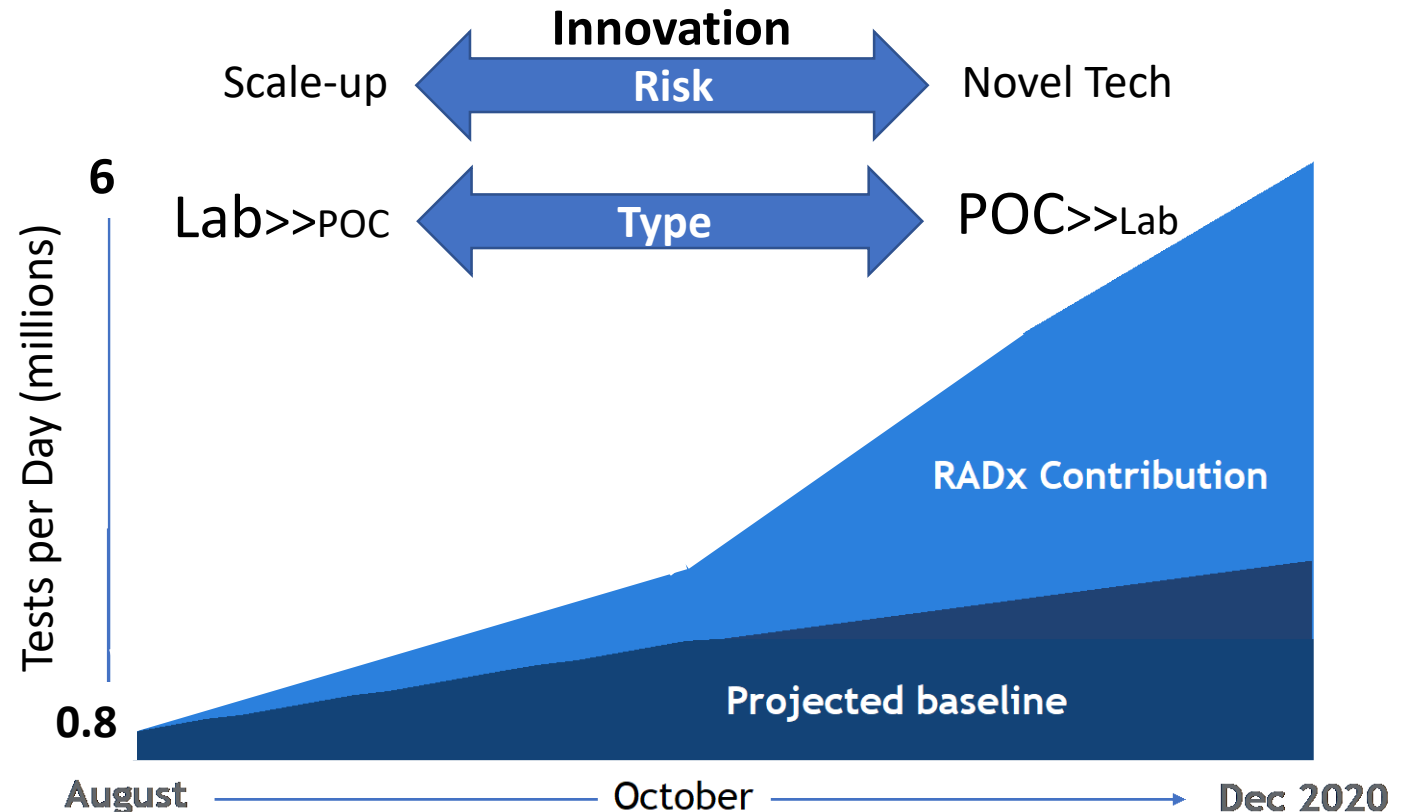
2) Optimize Performance: *Technologic and Operational; Match Community Needs*

Test Settings

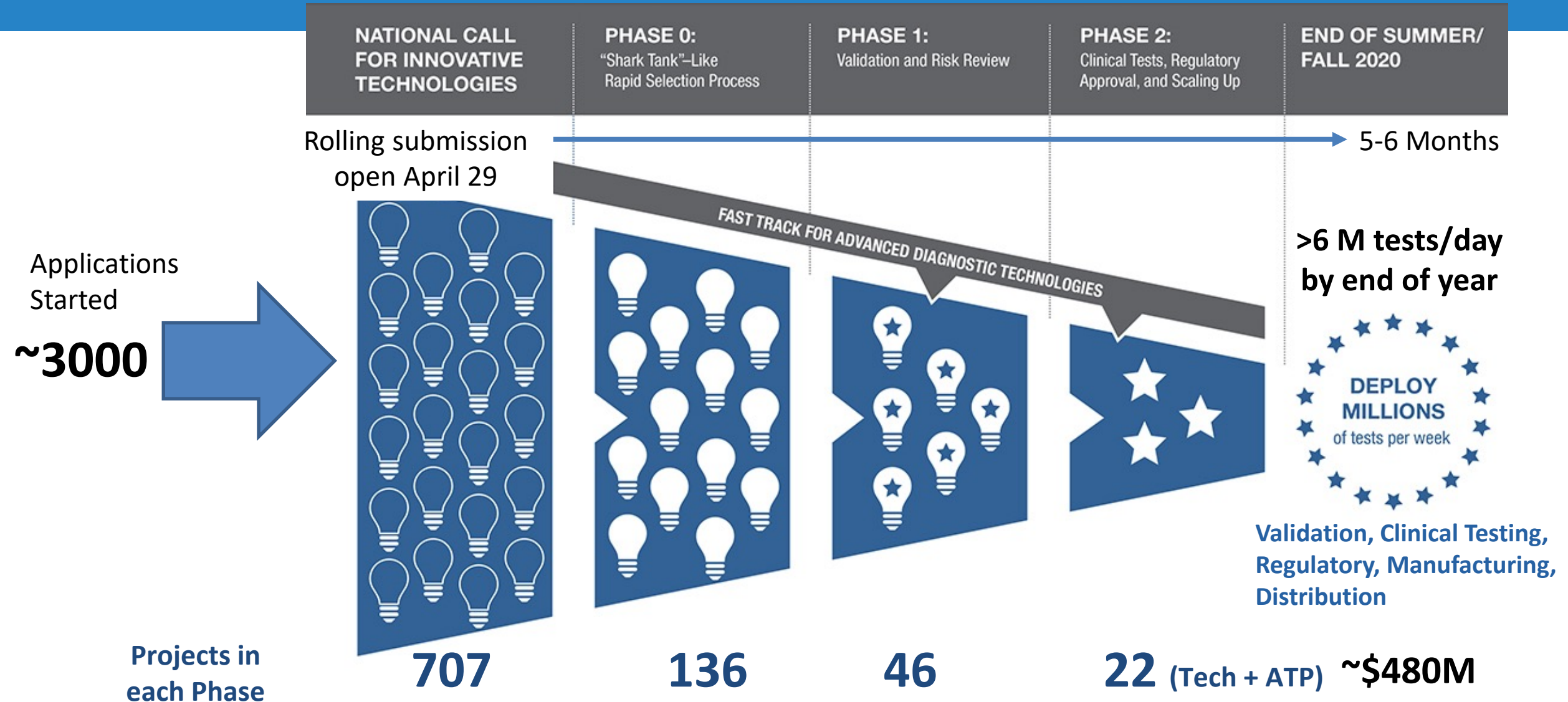
- Home-based
- Point of Care (POC)
- Laboratory (CLIA, research)



RADx
Launch:
~250k/day



RADx Innovation Funnel

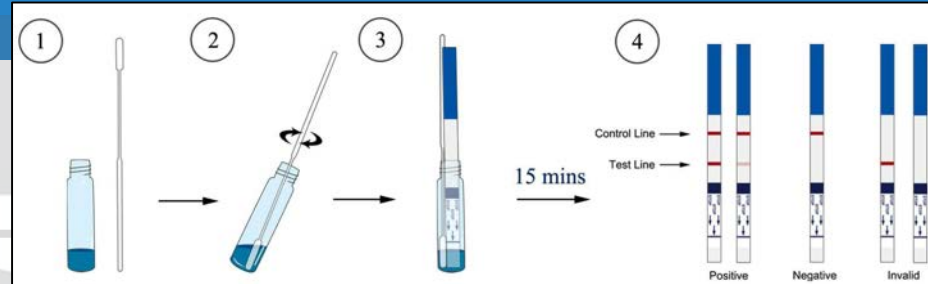


RADx Innovation Funnel

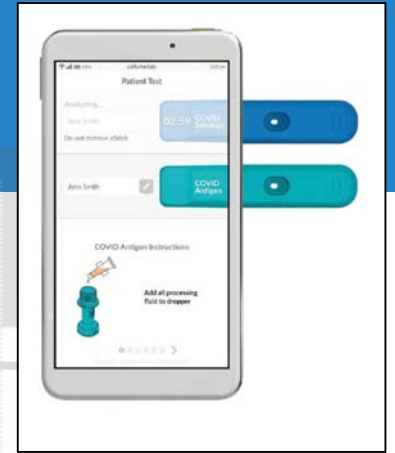


NATIONAL CALL
FOR INNOVATIVE
TECHNOLOGIES

ing submission
open April 29



2:
sts, Regulatory
and Scaling Up



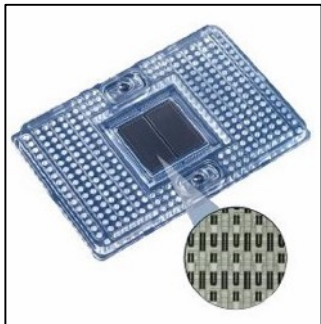
Innovation

- 1) Separation/concentration
- 2) μ -Fluidics
- 3) Chemistries, e.g. CRISPR, NGS
- 4) Labels, Reporters
- 5) Readout Tech
- 6) Miniaturization
- 7) Automation



/day
year

Validation, Clinical Testing,



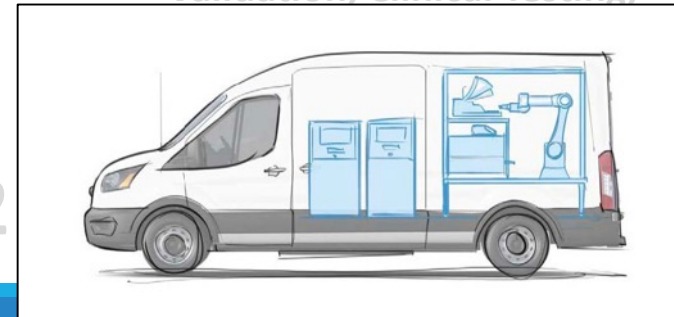
each Phase

707

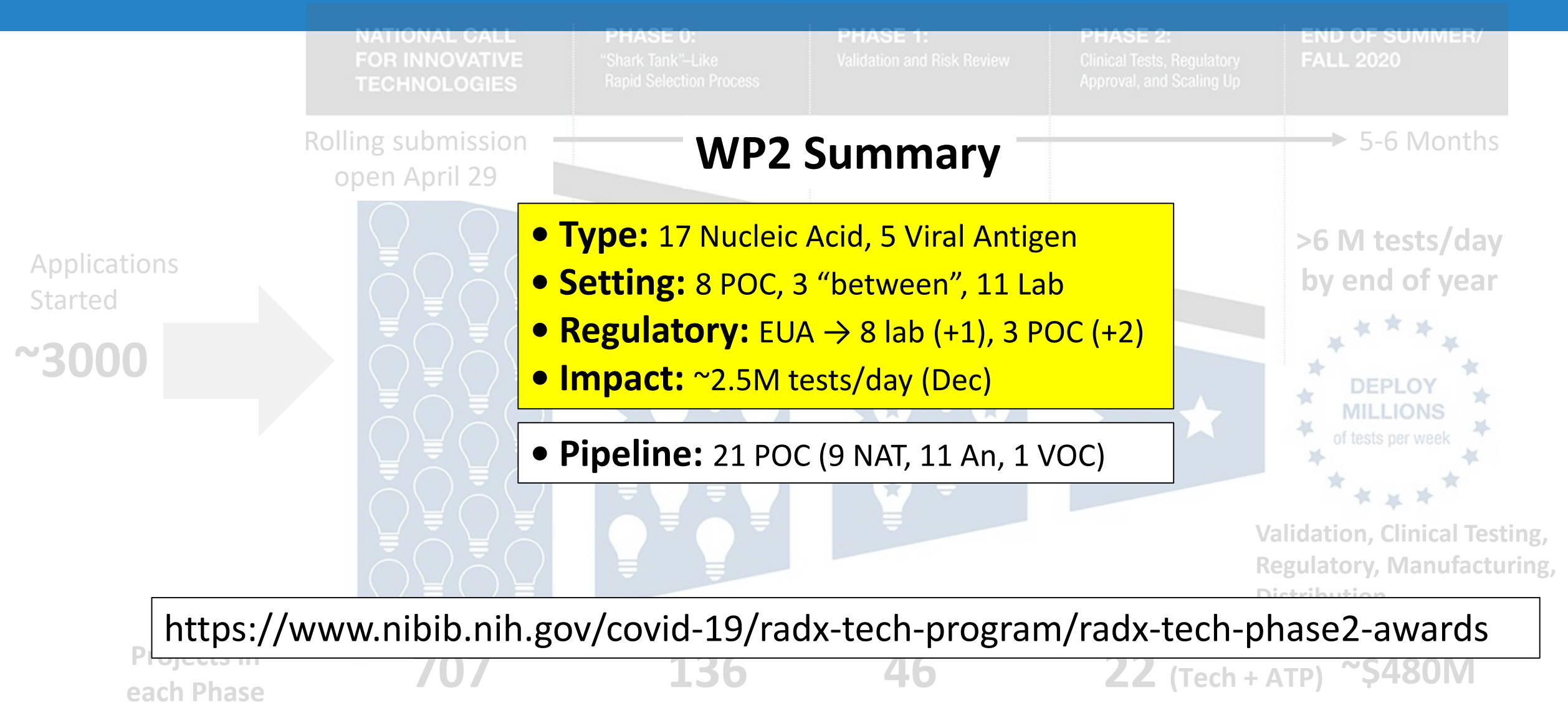
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46

22



RADx Innovation Funnel



Point-of-Care Technologies Research Network (POCTRN)

NIBIB National Network: 5-6 years for new POC technologies

Established 2007, Expanded 2020: >1000 RADx experts & contributors



Todd Merchak Tiffany Lash

<https://www.poctrn.org>



GaTech/Emory

- ✓ Engineering
- ✓ Design/Prototype
- ✓ Clinical Validation
- ✓ Biobank samples
- ✓ In-Home Validation

Johns Hopkins

- ✓ Public Health/STD
- ✓ Global Health
- ✓ Clinical Validation
- ✓ Biobank samples
- ✓ Validation in LMICs

CIMIT/MGH

- ✓ Coordinating Center
- ✓ Collaboration/Management Platform
- ✓ Business/Commercialization

Northwestern

- ✓ HIV/AIDS
- ✓ Engineering
- ✓ Global Health
- ✓ Clinical Validation
- ✓ Validation in LMICs

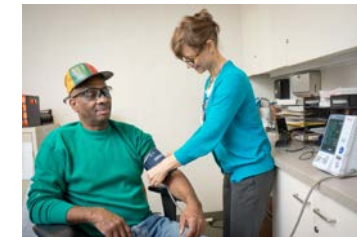
UMass

- ✓ Heart, lung, blood
- ✓ Engineering
- ✓ Clinical Validation
- ✓ Biobank samples
- ✓ Clinical Trials
- ✓ Business/Commercialization



Validation Core

15 projects complete, 11 ongoing, >1500 participants



Clinical Studies Core

Standard Trial Design, Digital Health Platform, Single IRB, Center Network



Deployment Core

Supply chain, Manufacturing, User Community, End to end solutions

Project Tech:

- 1) Review
- 2) Funding
- 3) Expertise
- 4) Testing

Point-of-Care Technologies Research Network (POCTRN)

NIBIB National Network: 5-6 years for new POC technologies

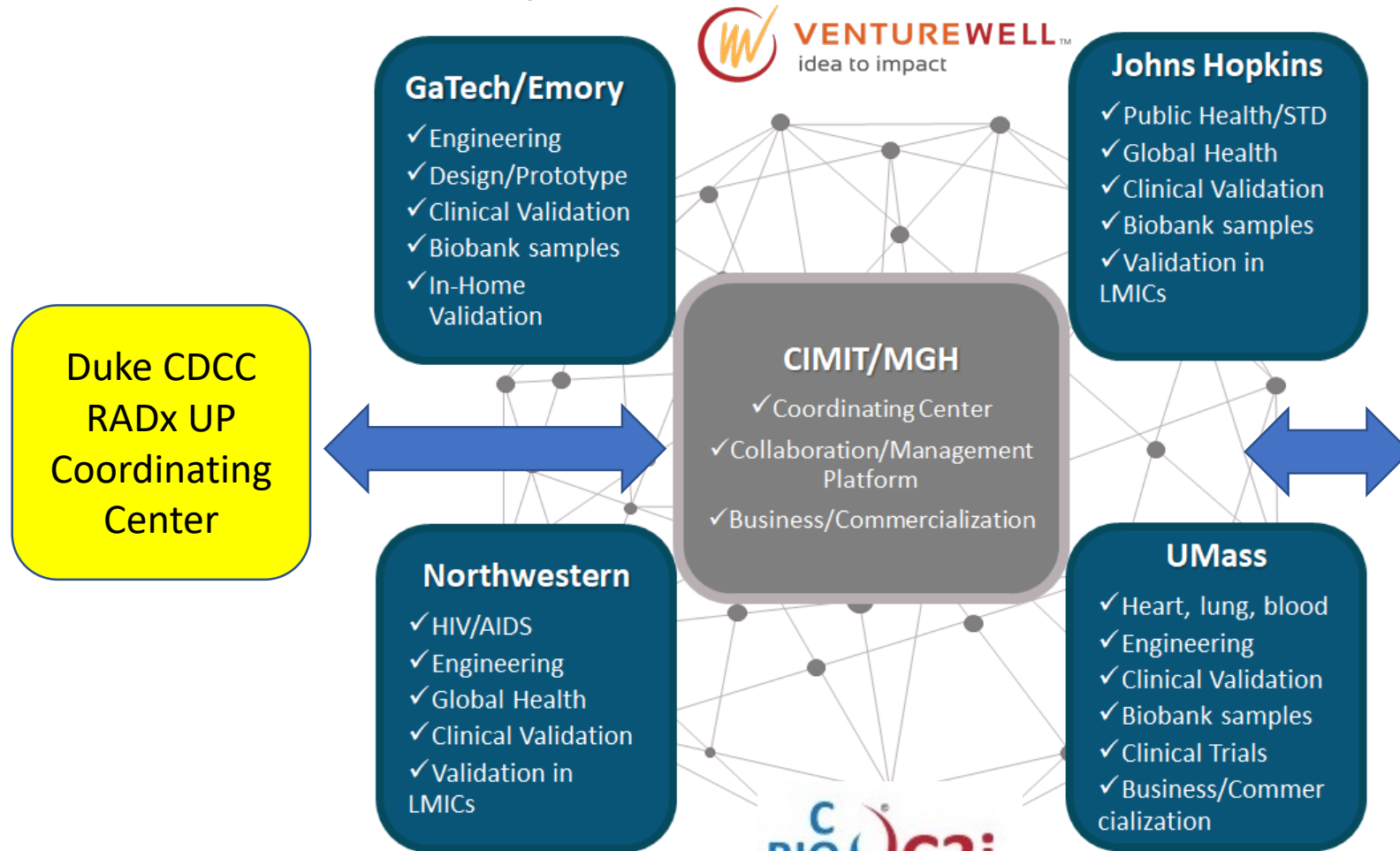
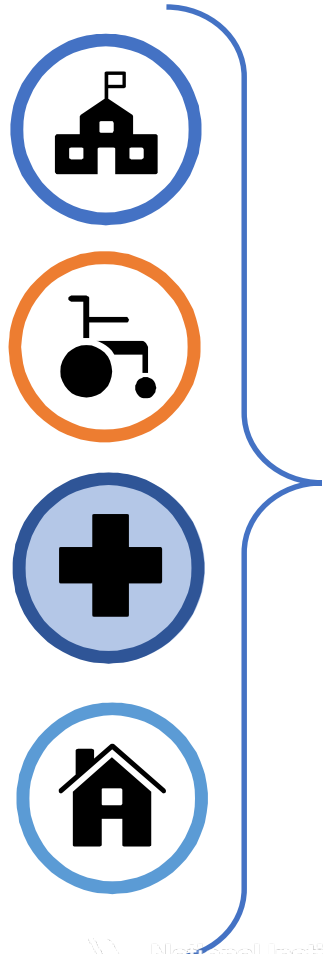
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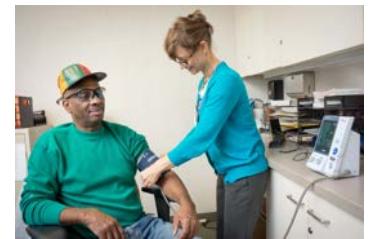


Todd Merchak Tiffany Lash

RADx UP



Validation Core



Clinical Studies Core



Deployment Core

RADx Test Validation Core (Emory-Gtech)

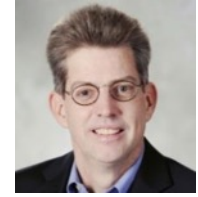
15 projects complete, 11 ongoing



Wilbur Lam



Greg Martin.



Oliver Brand

Feasibility

Ensure positive control (provided or commercial) is positive
Ensure negative matrix (i.e. saliva, patient sample or commercial) is negative
Ensure negative matrix spiked with live and/or inactivated SARS-CoV-2 virus is positive



Contrived
samples

Verify the limit of detection (LOD) via live and/or inactivated SARS-CoV-2 virus by serial dilution using correct matrix
Test non-SARS-CoV-2 coronaviruses (test specificity/cross-reactivity)
Test different strains of SARS-CoV-2 (strain variation)



Patient
samples

Test banked patient samples (adult and pediatric) with concomitant testing on reference method to determine concordance
Test prospective patient samples using collection sites **>1500 participants**
Calculate sensitivity, specificity, positive and negative predictive values with input from our biostatistical core

RADx Test Validation Core (Emory-Gtech)

15 projects complete, 11 ongoing

Feasibility

- Ensure positive control (provided or commercial) is positive
- Ensure negative matrix (i.e. saliva, patient sample or commercial) is negative
- Ensure negative matrix spiked with live and/or inactivated SARS-CoV-2 is positive

NIH score range: 1 (exceptional) to 9 (poor)

ACME POCT score: 2 (88% of respondents)

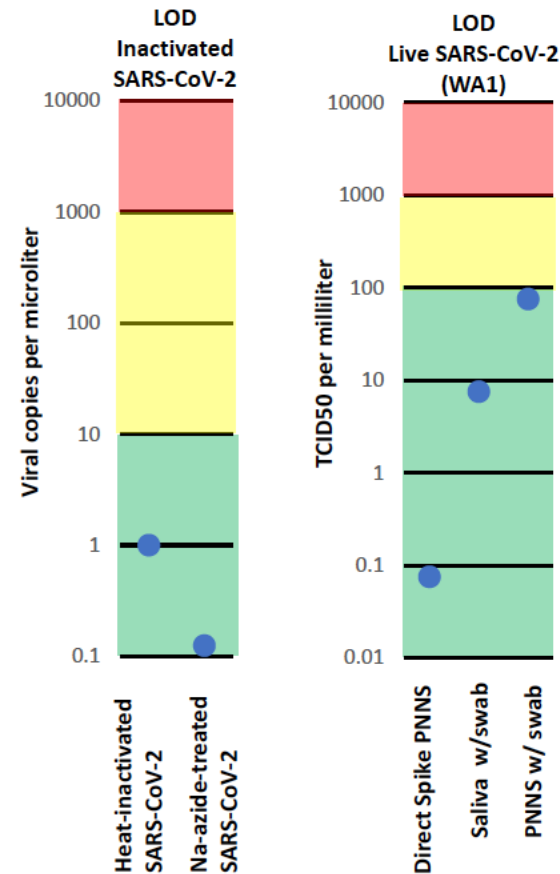
RADx Test Verification Core Recommendation: [Proceed to WP2](#)

Resume and Summary of Discussion: the RADx ACME POCT convened an internal study section on July 9th, 2020 to discuss the RADx Test Verification Core's analysis of Project #2244 in which the criteria for evaluation included: LOD, Sensitivity, Specificity, Repeatability, and Usability. The testing of this COVID-19 point-of-care (POC) PCR diagnostic test comprised of 1) LOD testing at several of our sites, including our Emory PSL 2 facility, Children's Healthcare of Atlanta clinical pathology laboratory, and laboratories in

Patient samples

- Test banked patient samples (adult and pediatric) with known status
- Test prospective patient samples using collection sites
- Calculate sensitivity, specificity, positive and negative predictive values

OVERALL SUMMARY OF RESULTS ACROSS ACME POCT SITES



Specificity	
Virus Type	Lack of Cross-Reactivity?
OC43 seasonal coronavirus	✓
MERS (heat inactivated)	✓

Prospective Clinical Results

		DiaSorin RT-PCR	
		+	-
2244	+	4	0
	-	0	48
Sensitivity: 100% Specificity: 100%			

RADx Clinical Studies Core (UMass)

Mission: Evaluate RADx platforms that advance to Phase 2 in rigorous clinical studies w/ diverse populations and settings.

Standard Trial Design: Master protocols, powered studies (~250 subjects), device-specific amendments, accelerate regulatory review

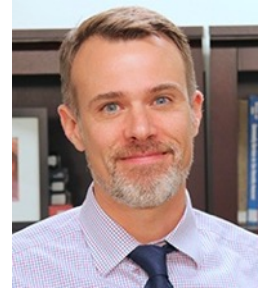
Eureka Digital Health Platform mobile app and website, participants enter own data

Data Safety Board and Single IRB for oversight and safety monitoring

Robust Research Center Network: POCTRN core center network for enrollment (w/Practice Based Research Network and Centers for Clinical and Translational Science assisting)



Laura Gibson, MD



David McManus, MD



RADx Deployment Core (CIMIT)

Bridging NIH/USG, non-profit Foundations, Academia, and Industry

Mission

Provide support for successful commercialization and deployment of COVID-19 solutions in unique communities.

- Members: 32
- Nancy Gagliano, MD, Core Lead
- Brian Walsh, Commercialization Lead
- Sreeram Ramakrishnan, Data Solutions Lead
- Susan Moreira, Deployment Lead



Nancy Gagliano, MD

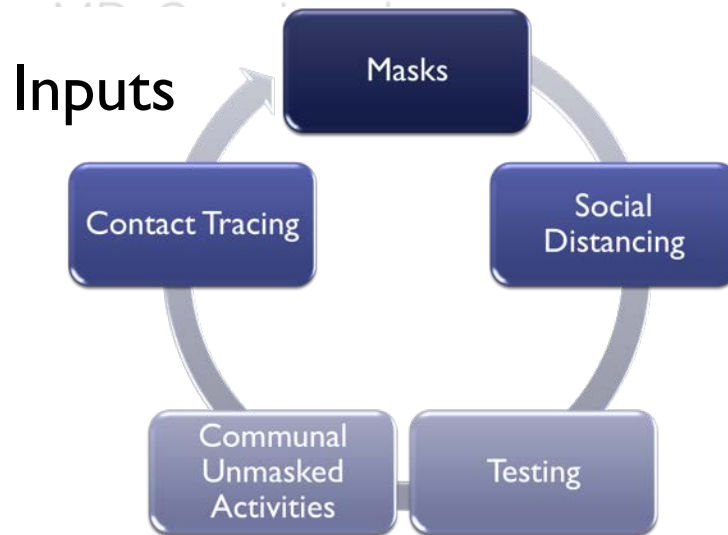
Current Highlights

- Supply Chain continues to be core challenge
- Development of Testing Model has received international recognition
- User communities need end-to-end solutions to deploy COVID testing
- Design-a-thon scheduled to develop data solutions

RADx Deployment Core (CIMIT)

Bridging NIH/USG, non-profit Foundations, Academia, and Industry

“When-to-Test” modeling tool: Match testing approaches w/needs; evaluate impact of risk reducing activities.



www.poctrn.org
RADx webinars, tools

TEST OPTIONS (UNDER 'TYPICAL' CONDITIONS)

	Test 1 POC instrument- based antigen test from nasal sample	Test 2 POC molecular test (e.g. PCR) from NP sample
Does test meet needed turnaround time	Yes	Yes
Number of people to be tested in a day	111	91
Recommended max days between tests/person	9	11
Number of instruments required	4	3
Total instrument capital cost	\$7,000	\$30,000
Staff required	3	3
Cost per test	\$43.77	\$47.03
Daily test cost	\$4,858	\$4,280

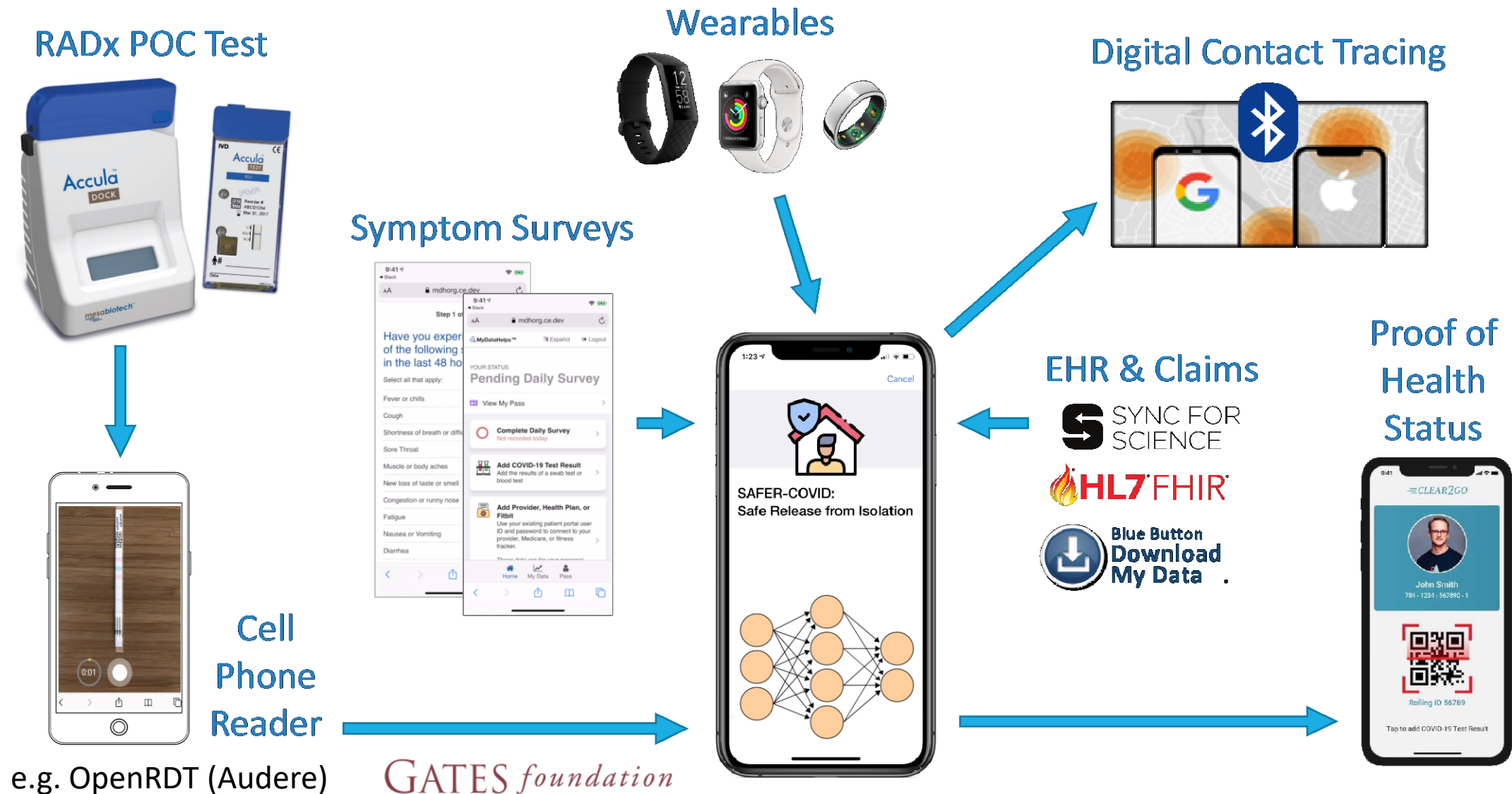


Anette Hosoi
MIT



Paul Tessier,
CIMIT/MGH

RADx Digital Health Networks: *Integration*



Andrew Weitz
NIBIB



Jason Levine
NCI

RADx Tech/ATP Summary

RADx Tech/ATP:

Accelerating innovation, Multiple platforms, Millions tests/day

Implementation Challenge:

- Standard Medical Diagnostics: *accurately detect/diagnose disease in individuals*
- **COVID Paradox: rapidly assess, track +/- of disease in large, asymptomatic populations**
- Barriers: *Economic, cultural*

RADx Partnerships:

- Guidelines: *match & deploy tech and test protocols for range of use cases (what test/when?)*
- Evaluate: *performance, impact, efficacy; validate models*
- Inspire: *testing + DH platforms for widespread screening/surveillance*