THE UNIVERSITY OF
TENNESSEE
HEALTH SCIENCE CENTER™

The Role of Laboratory Testing in the Covid-19 Pandemic

Department of Diagnostic & Health Sciences
College of Health Professions

Introduction

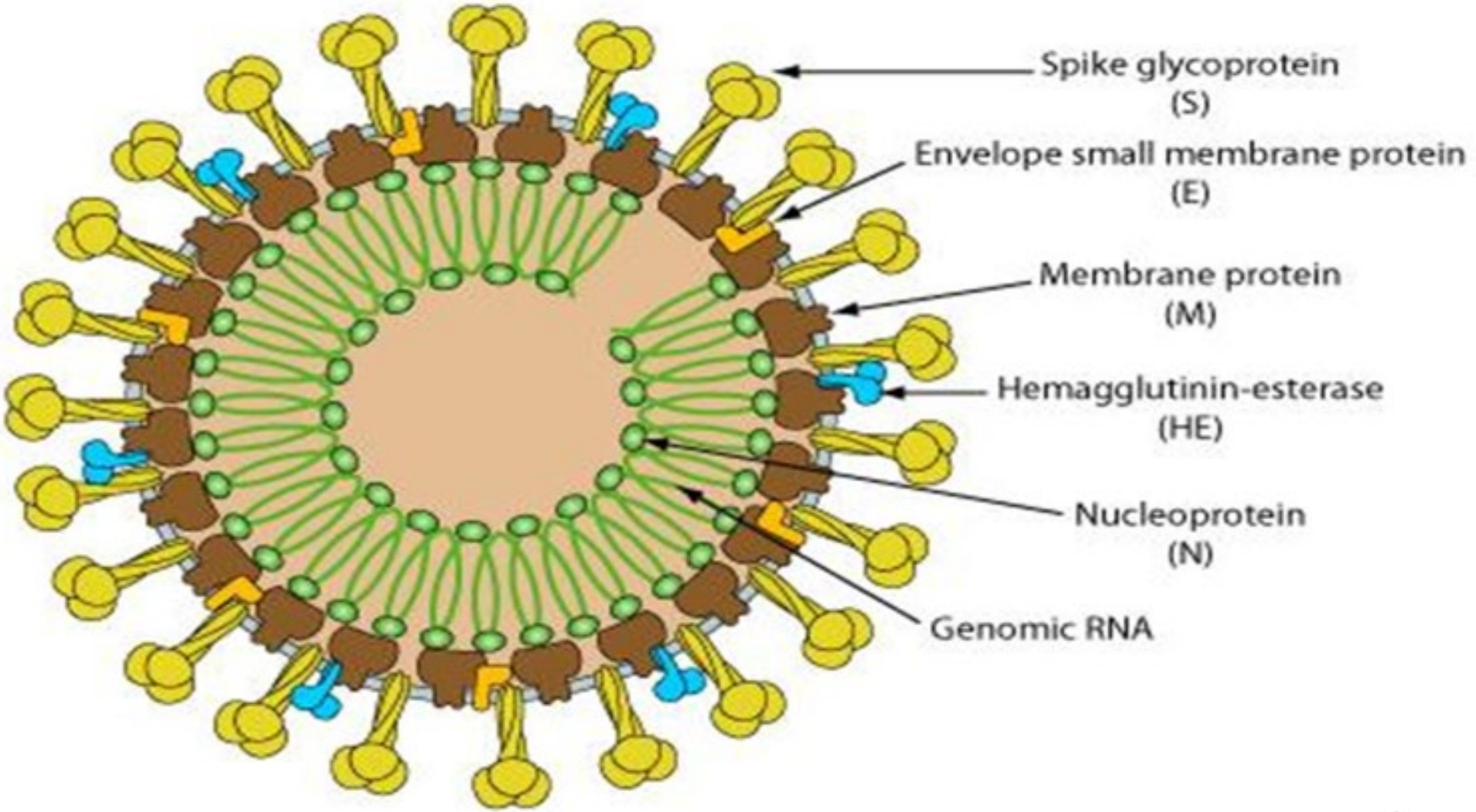
Hassan Aziz, PhD, FACSs, MLS(ASCP)^{cm}
Professor


Medical Laboratory Professionals Week
LABORATORY PROFESSIONALS GET RESULTS
APRIL 19-25, 2020
#LABWEEK

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

Update/Overview of COVID-19

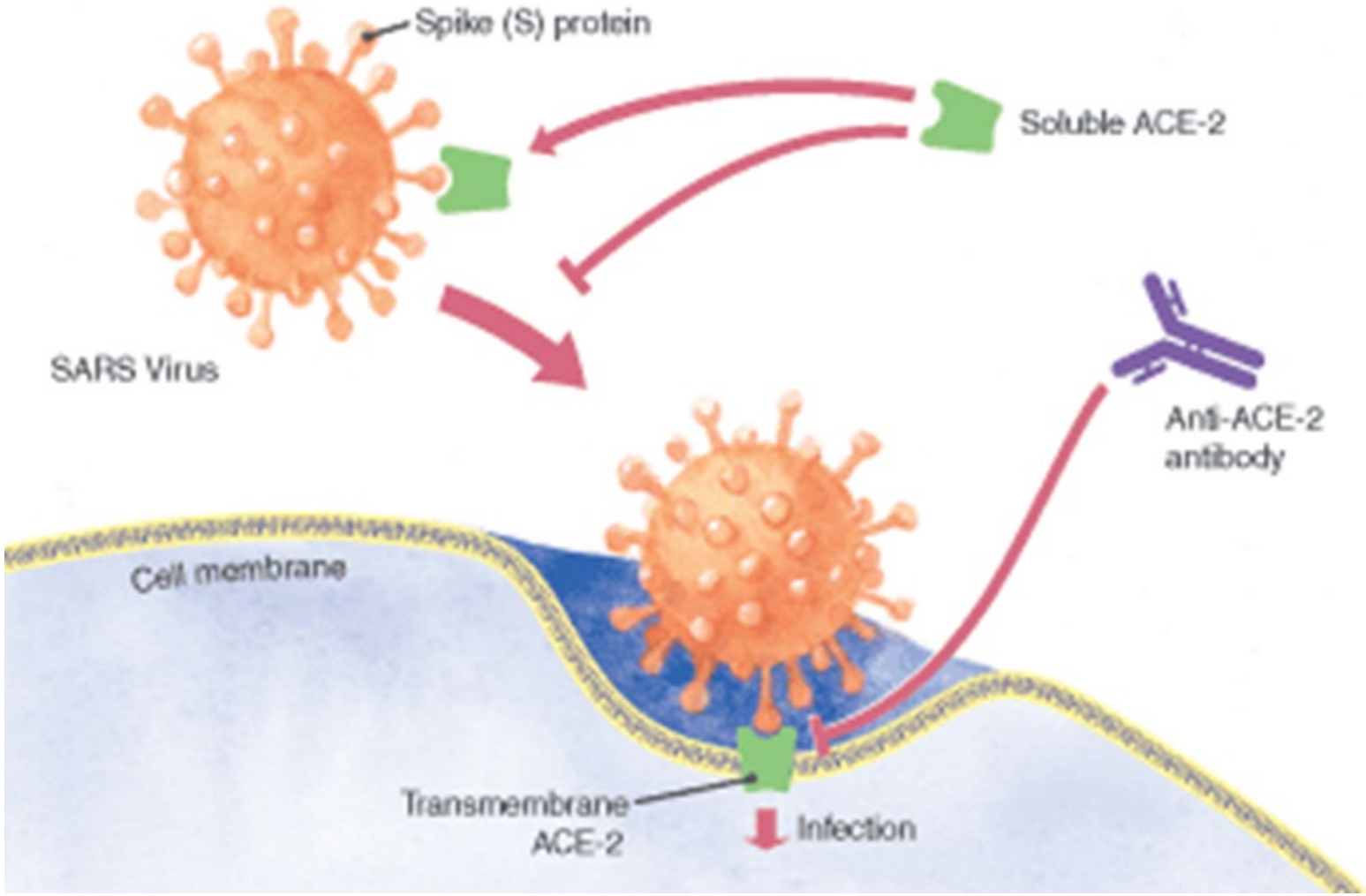
Linda Williford Pifer, PhD, SM (ASCP), GS (ABB)
Professor


Spike glycoprotein
(S)
Envelope small membrane protein
(E)
Membrane protein
(M)
Hemagglutinin-esterase
(HE)
Nucleoprotein
(N)
Genomic RNA

Angiotensin-I converting enzyme **2** (**ACE-2**) is the receptor for **coronaviruses**

This enzyme acts to reduce blood pressure and inflammation

COVID-19 VIRIONS BIND TO ACE-2 RECEPTORS ON CELL MEMBRANE



6 KNOWN CORONAVIRUSES & 3 OUTBREAKS

1. 229E, NL63, OC43, or HKU1 **relatively insignificant**

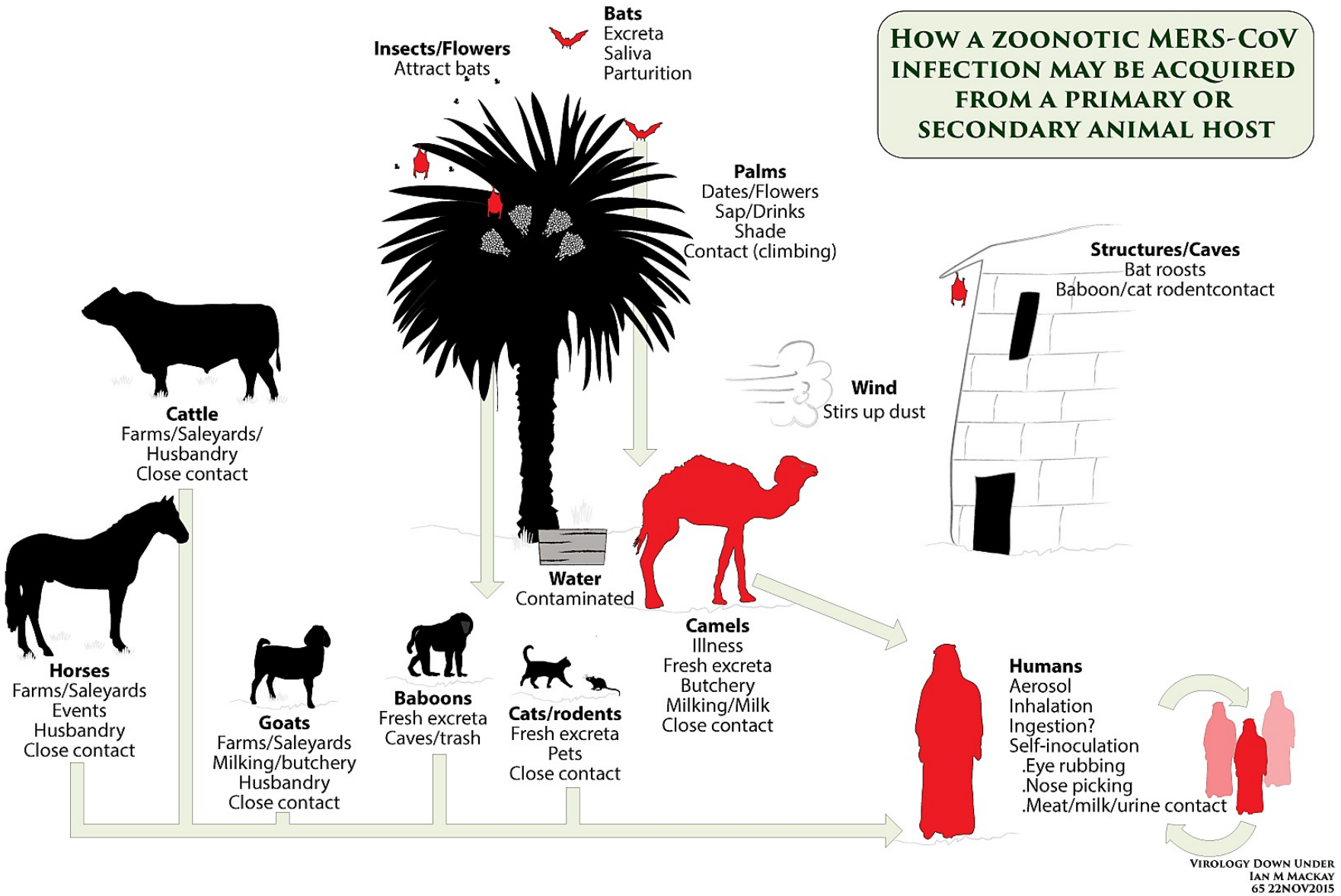
2. SARS-1 Coronavirus…
   Severe Acute Respiratory Syndrome (outbreak in 2003. Guangdong Province, China); CFR= 10% (Case/fatality ratio)

3. MERS Coronavirus
   Middle Eastern Respiratory Syndrome; CFR = 34%

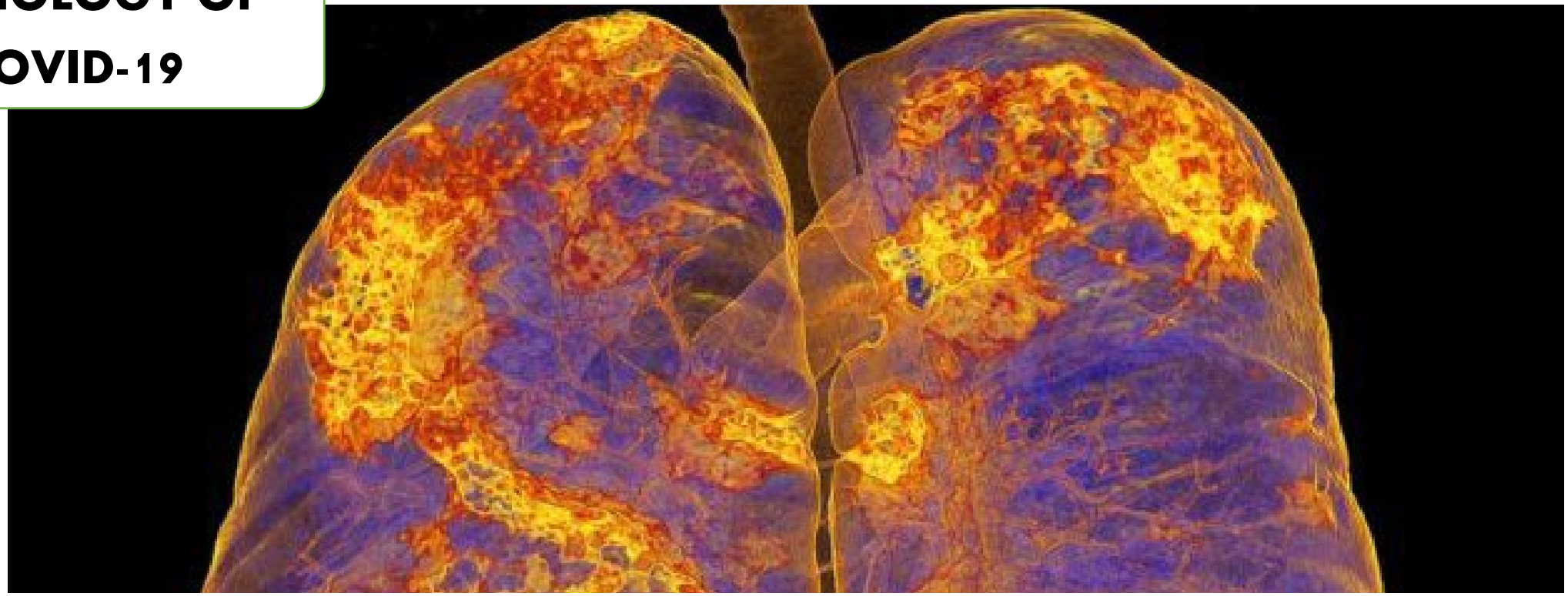
4. SARS-2 (COVID-19)
   Wuhan, China … 2019-2020?
   CFR = 2-3% (CFR = 2-3%) Ro = 1.4 - 2.5 (Transmission rate/patient)

PANGOLIN, HORSESHOE BAT & CIVET CAT… ALL CORONAVIRUS VECTORS

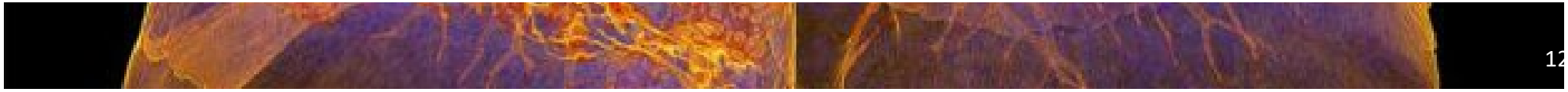
How a zoonotic MERS-CoV infection may be acquired from a primary or secondary animal host

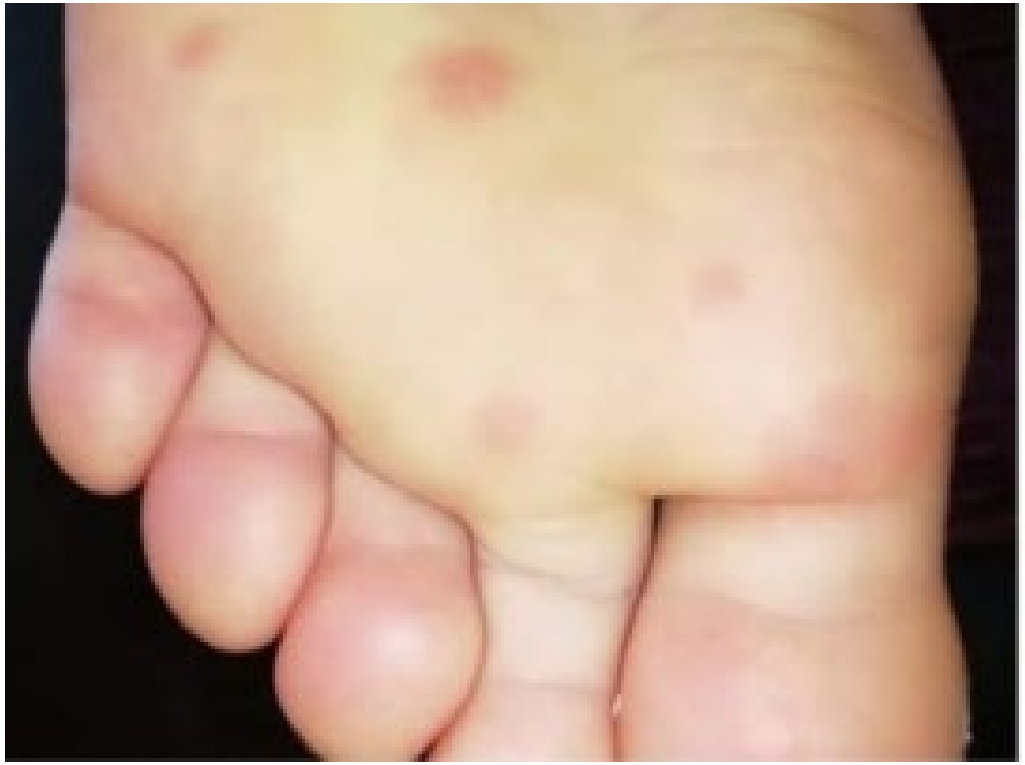


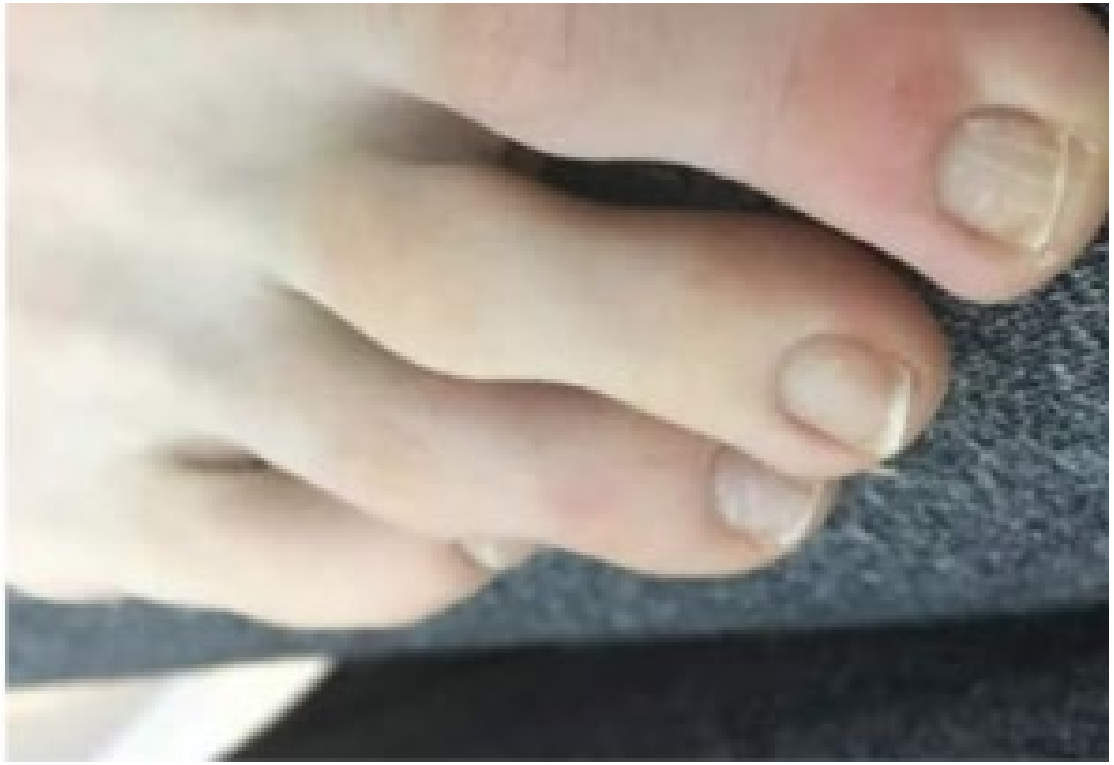
PATHOLOGY OF COVID-19



DYSPNEA, FEVER, COUGH, WEAKNESS, SORE THROAT, ACHES, HEADACHE
EXTREME WEAKNESS SOMETIMES REQUIRING PHYSICAL THERAPY





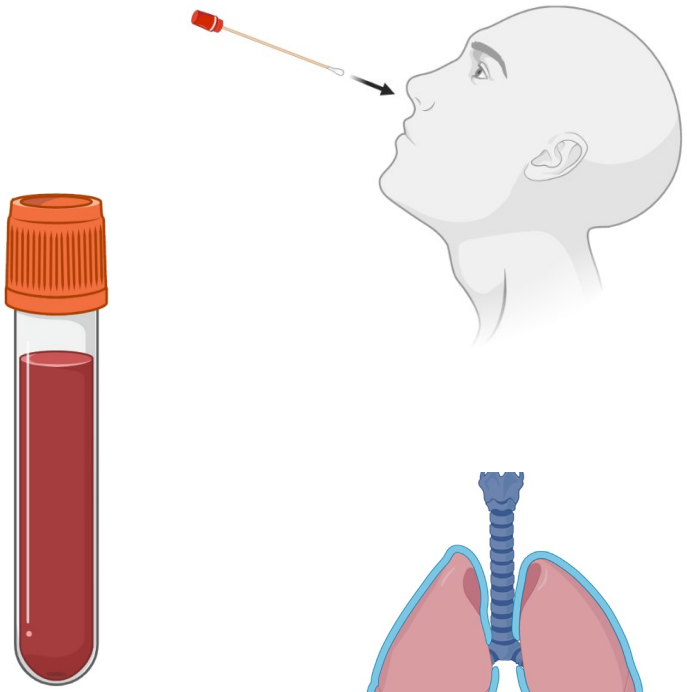


OTHER: FOOT LESIONS, LOSS OF SENSE OF SMELL & TASTE, CONFUSION,INFLAMMATORY ENCEPHALITIS, NEUROLOGIC, DEFICITS, STROKE, HEADACHE, DIARRHEA, PRESENCE OF VIRAL SHELLS SEEN IN EM'S OF BOWEL SECTIONS.

Specimen Collection
Antigen versus Antibody Testing for SARS-CoV-2

Jacen Moore, PhD, MA, MT (ASCP)
Assistant Professor

COVID-19 Specimen Collection

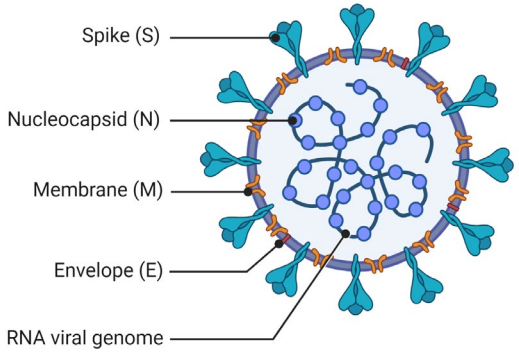


- Nasopharyngeal or Oropharyngeal swabs
  - Swabs must be plastic with artificial cotton
- Blood or tissue (autopsy)
- Respiratory
  - Respiratory aspirate
  - Bronchial alveolar lavage
  - Sputum
    - Productive, not induced
- Stool or Urine
  - Less reliable

Image produced using Biorender. com

What is a SARS-CoV-2 antigen or antibody?

- SARS-CoV-2 ‘Antigen’
  - Portions of the virus that the body recognizes as foreign or non-self



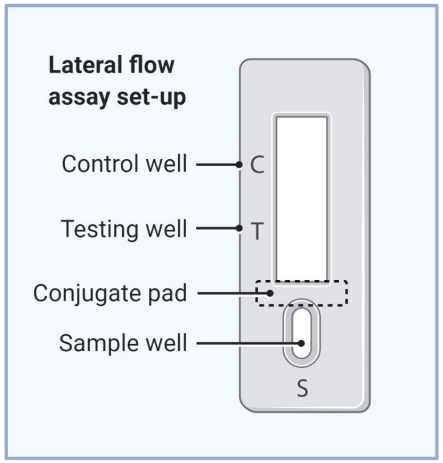
  - Testing for portions of virus directly
  - Determines if person is acutely or chronically infected

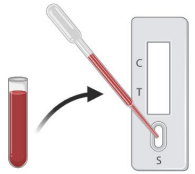
- Antibodies
  - Y-shaped proteins made by the body in response to virus

  - Can provide protection against the virus and indicate viral exposure

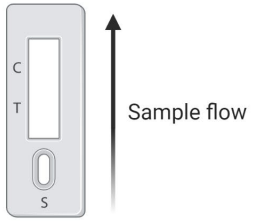
Images produced using Biorender. com

Serologic-Based Testing for COVID-19 Antibodies

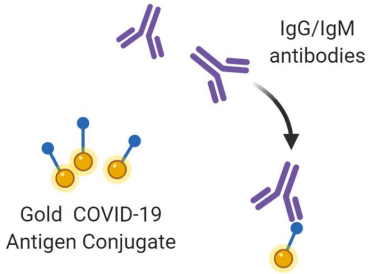




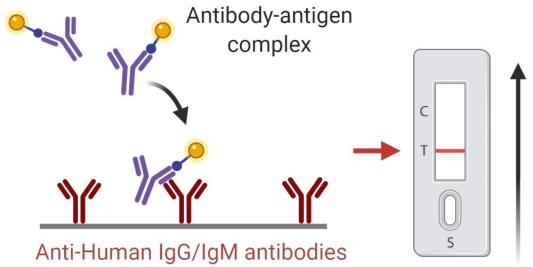
1 **Sample loading and Incubation**



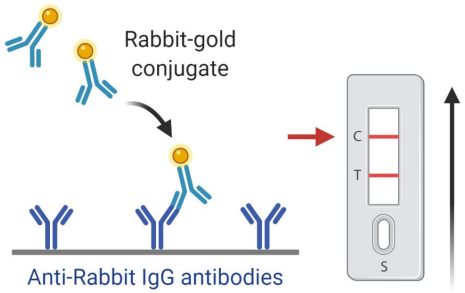
2 **Sample incubation**



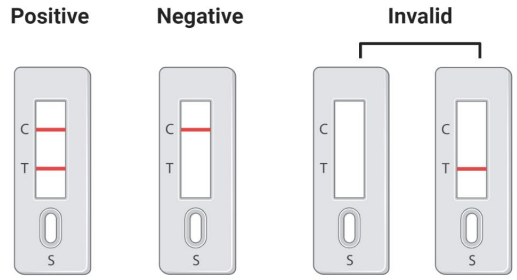
3 **Antibody-antigen recognition**



4 **COVID-19 antibody detection**



5 **Control antibody detection**



6 **Interpreting results**

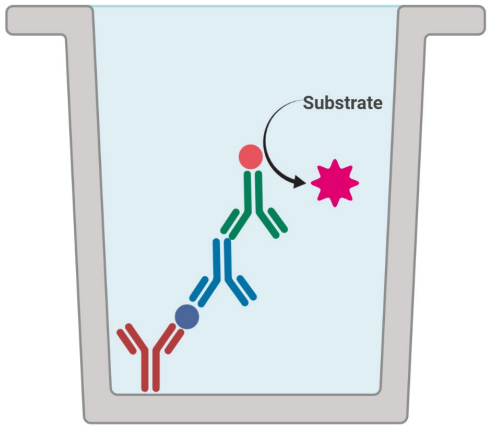
Image produced using Biorender. com

Antigen-Based Testing for SARS-CoV-2

- Enzyme-linked immunosorbent assay (ELISA)
  - Antibodies ‘capture’ COVID antigen
  - Secondary antibodies bind to captured antigen
  - Enzyme-labelled tertiary antibodies detect bound secondaries
  - Substrate allowed to react with enzyme
  - Direct relationship between antigen quantity and substrate intensity

- Fluorescence Immunoassay (FIA)
  - Fluorescently labelled antibodies bind COVID antigen
  - Instrument measures fluorescence intensity
  - Direct relationship between antigen quantity and fluorescence intensity

ELISA



FIA

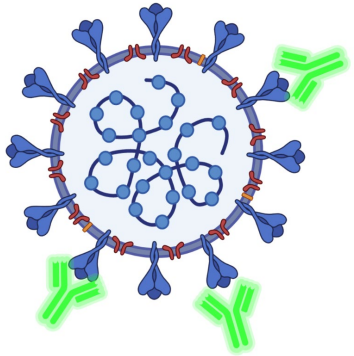


Image produced using Biorender. com

Antigen versus Antibody Testing

	Antigen	Antibody
What test identifies	Viral proteins or RNA	Host antibodies to virus
What test can tell you about infection status	Actively infected	Has been infected or exposed
When the test can be used accurately	During the acute phase of infection	Days-years in late or post-infection
Testing complexity	Highly complex and requires trained personnel and instrumentation	Easy to perform-can be done as point of care using rapid test devices
Sensitivity and specificity	Varies depending on test system	Varies depending on test system
Sample requirements	Swabs, BAL, Aspirates, Sputum, tissue biopsy, blood	Blood, saliva

Current Status of Diagnostic and Screening Tests for COVID-19

Anami Patel, PhD
Vice President, Poplar Healthcare

FDA- Emergency Use Authorization (EUA)

- Guidance issued Feb. 29, 2020 describes a policy regarding certain laboratories immediately using tests they developed and validated in order to achieve more rapid testing capacity in the U.S.
- To address the COVID-19 public health emergency, the FDA has determined that prior public participation for this guidance is not feasible or appropriate and issued this guidance without prior public comment.
- This guidance document is immediately in effect, but it remains subject to comment in accordance with the FDA's good guidance practices

EUA: Scope

- The new policy is limited to:

– Laboratories certified to perform high complexity testing, consistent with the requirements under the CLIA – Molecular diagnostics for SARS-CoV-2

- The new policy does NOT impact:

– Requirements under the CLIA

– CDC recommendations for who should be tested

EUA: Policy

The guidance includes recommendations regarding:

- Validating newly developed SARS-CoV-2 tests prior to clinical use
- Notifying FDA when clinical use of a validated test begins
- Confirming the first 5 positive and negative samples with an EUA authorized test
- Indicating in test reports that the test has been validated but independent review by FDA is not yet complete
- Submitting an EUA within 15 days of initiating testing
- Steps to take if any specimens fail confirmatory testing or if FDA is unable to authorize the EUA

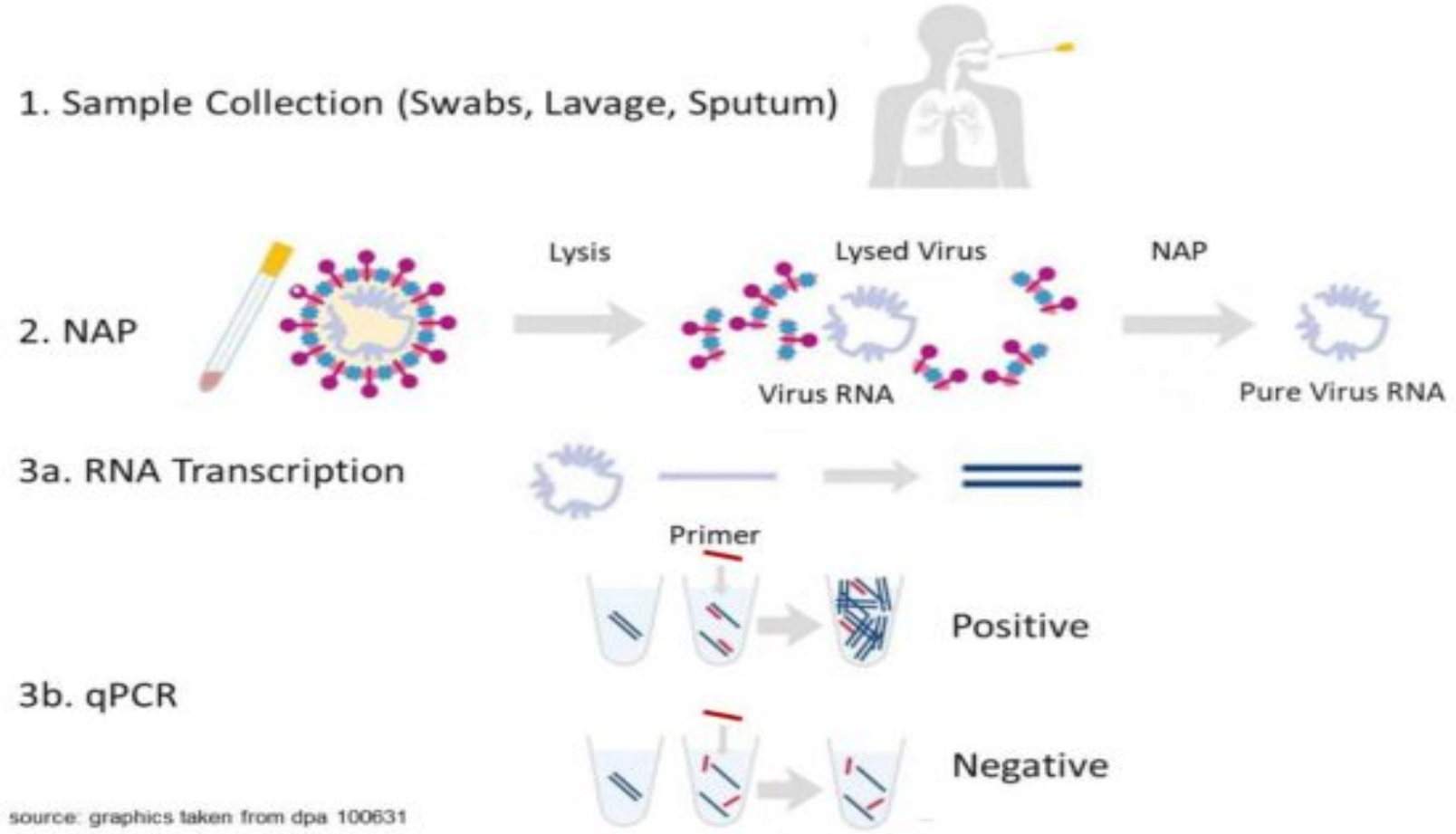
EUA: Test Validation

- The guidance includes recommendations regarding the minimal testing to be performed for validation:
  - Limit of Detection (LoD)
  - Clinical Evaluation
  - Inclusivity
  - Cross-Reactivity
- Limited viral materials are available
  - FDA, BARDA, and CDC prioritize and coordinate shipments to labs when ready to validate

Poplar Healthcare Testing Workflow

- Roche cobas 6800 EUA: SARS-CoV-2 RNA detection
- ThermoFisher: SARS-CoV-2 RNA detection
- CDC-IDT: CDC 2019-nCoV RNA

Test Workflow



Test Workflow

Sample collection

Samples collected using BD Universal Viral Transport Collection Kits:

- Bronchoalveolar lavage
- Nasal aspirate
- Nasopharyngeal swabs

Sample prep

KingFisher Flex Purification System with MagMAX Viral/Pathogen Nucleic Acid Isolation Kit

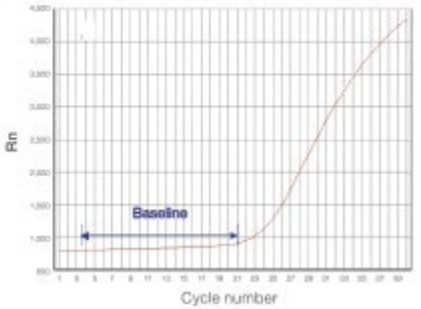
Real-time PCR

QuantStudio 5 Real-Time PCR System or 7500 Real-Time PCR System

TaqMan 2019-nCoV Assay and Control Kits

TaqPath 1-Step RT-qPCR Master Mix, CG

Data analysis



Amplification curves using the 7500 or QuantStudio 5 Real-Time PCR System software

* For Research Use Only. Not for use in diagnostic procedures.

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Roche cobas 6800

- EUA: cobas SARS-CoV-2 RNA detection
- Detection of SAR-COV-2 and pan-Sarbecovirus
- Specimen Types: Nasopharyngeal & Oropharyngeal swab in UTM, UVT, or Saline
- Specimen Transport: 15°C to 30°C
- Specimen Transport & Storage: 2°C to 25°C and processed within 48 hrs. OR dry ice if >48 hrs.
- Capacity: 94 samples can be resulted in 6 hrs.

Roche cobas 6800
Result Interpretation

- Target 1: SARS-CoV-2, Target 2: pan-Sarbecovirus
- If both targets positive – SARS-CoV-2 detected
- If only Target 1 positive – SARS-CoV-2 detected
- If only Target 2 positive – SARS-CoV-2 Presumptive positive

- All positive/negative results are called back to providers & state

ThermoFisher: TaqPath COVID-19 Combo Test

- EUA*: SARS-CoV-2 RNA detection
- Detection of SAR-COV-2
- Specimen Types: Nasopharyngeal & Oropharyngeal swab in UTM, UVT, or Saline
- Specimen Transport: 15°C to 30°C
- Specimen Transport & Storage: 2°C to 25°C and processed within 48 hrs. OR dry ice if >48 hrs.
- Capacity: 94 samples can be resulted in 6 hrs.

* **Poplar Healthcare has submitted for EUA**

ThermoFisher: COVID-19 Result Interpretation

- Target 1: ORF1ab, Target 2: N gene, Target 3: S gene
- If any two targets positive – SARS-CoV-2 detected
- If Two or more Targets positive – SARS-CoV-2 detected
- If only one Target positive – SARS-CoV-2 Inconclusive

- All positive/negative results are called back to providers & state

CDC (IDT): 2019-nCoV

- EUA*: CDC 2019-nCoV RNA
- Detection of 2019-nCoV RNA
- Specimen Types: Nasopharyngeal & Oropharyngeal swab in UTM, UVT, or Saline
- Specimen Transport: 15°C to 30°C
- Specimen Transport & Storage: 2°C to 25°C and processed within 48 hrs. OR dry ice if >48 hrs.
- Capacity: 60 samples can be resulted in 6 hrs.

* **Poplar Healthcare has submitted for EUA**

CDC (IDT): 2019-nCoV Result Interpretation

- Target 1: 2019 nCoV_N1, Target 2: 2019 nCoV_N2 gene
- If both targets positive – 2019 nCoV detected
- If only one Target positive – 2019 nCoV Inconclusive

- All positive/negative results are called back to providers & state

Assay limitations

- Reliable results depend on proper sample collection, storage and handling procedures
- Mutated virus strain
- Not for monitoring treatment
- Not for screening of blood or blood products

Pathology and Lab Medicine and its role in a deadly pandemic: How the UTHSC Pathology Department responded to the Coronavirus crisis in the first 45 days

Mahul B. Amin, MD
Professor and Chairman

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

PATHOLOGY AND LAB MEDICINE AND ITS ROLE IN A DEADLY PANDEMIC:

HOW THE UTHSC's PATHOLOGY DEPARTMENT RESPONDED TO THE CORONAVIRUS CRISIS IN THE FIRST 45 DAYS

Mahul Amin, MD

Professor and Chairman

UTHSC Gerwin Chair of Cancer Research

Department of Pathology and Laboratory Medicine

SHOUT OUT!!

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

- **National Medical Laboratory Professionals Week** is an annual celebration of the medical laboratory
- Originated in 1975: 44th year
- Recognition & awareness of the important work by these professionals
- Lab professionals are engaged as vital partners in clinical care: 24/7/365
- Lab results are an integral part of the medical records of any patient
- More than 60% of medical diagnoses are dependent significantly on pathology and laboratory results.

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D-PATH Dermatopathology · GI PATHOLOGY One Purpose. One Passion. · OncoMetrix Definitive Cancer Diagnostics · DIAGNOSTICS · WOMEN'S HEALTH LABORATORIES

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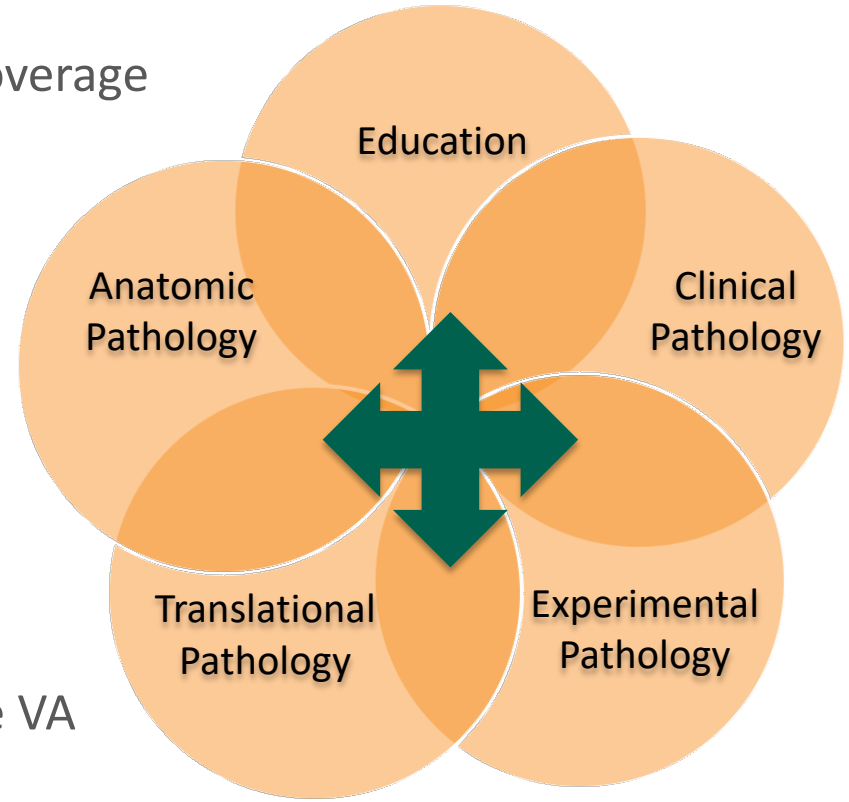
2017-2020.

UCH

Transfusion Medicine Coverage
Microbiology

UTMPG

Subspecialty (expert opinion) coverage at the VA and for ROH cases



West Clinic

CLINICAL

RESEARCH

St. Jude

National & International Collaborations

SO - WHY AM I HERE TODAY?

TO HELP OUR TEAM WIN AGAINST PANDEMICS

CONTEMPORARY HEALTH CARE IS INCREASINGLY BECOME A TEAM SPORT

DEPT. OF PATHOLOGY & LAB MEDICINE RESPONSE

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

1

CONSULTATIVE SERVICES

2

DEVELOP & OFFER PCR TEST

3

DEVELOP SEROLOGIC TESTING

4

PARTICIPATE IN CORONAVIRUS CONVALESCENT PLASMA PROGRAM

5

PUBLIC HEALTH REPORTING & FACILITATING PREDITICTION MODELS

6

FACILITATE FUTURE RESEARCH

1

CONSULTATIVE SERVICES

2

3

4

5

6

POPLAR HEALTHCARE

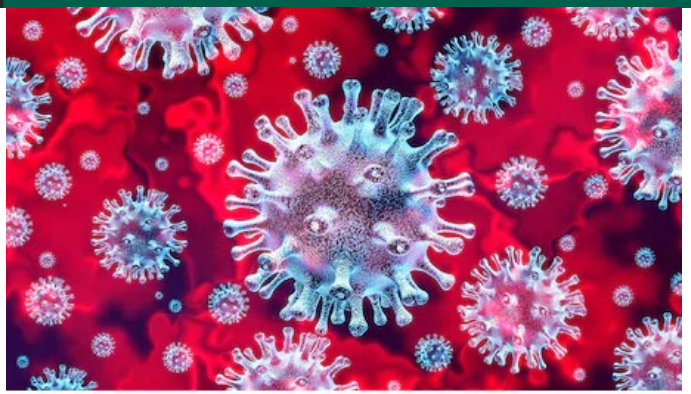
D-PATH Dermatopathology

GI PATHOLOGY One Purpose. One Passion.

OncoMetrix Definitive Cancer Diagnostics

UroPath DIAGNOSTICS

WOMEN'S HEALTH LABORATORIES



CONSULTATIVE SERVICES

- Test selection
- Test Implementation
- Test Interpretation
- Send out testing
- Logistics arrangement

DEPT. OF PATHOLOGY & LAB MEDICINE RESPONSE

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

1

2

DEVELOP & OFFER PCR TEST

3

4

5

6

TRANSLATIONAL RESEARCH INIATITIVE :

TISSUE REPOSITORY

2016 → **2019**

- Tissue repository from Methodist University 1992-2005

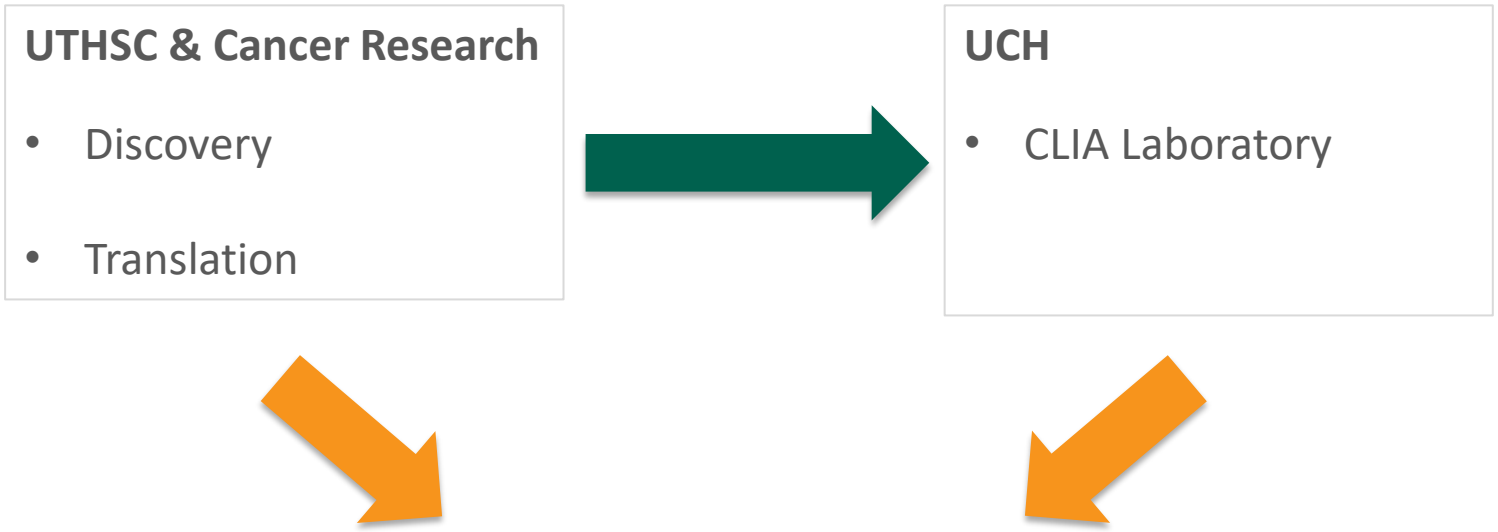
- Tissue repository *2003-2008 data "digital and searchable" with over 100,000 specimens*
- Histology core in partnership with Office of VC of Research
- Cancer translational research initiatives…

TRANSLATIONAL RESEARCH INITIATIVE:

GENOMICS

Overview

- Acquired: 2018
- In partnership with the UTHSC Center for Cancer Research



UTHSC PIONEERED "PRECISION/PERSONALIZED"

INNOVATIVE DIAGNOSTIC APPROACHES

TRANSLATIONAL RESEARCH INITIATIVE :

GENOMICS

Overview

- Started: 2018
- In partnership with UTHSC Center for Cancer Research

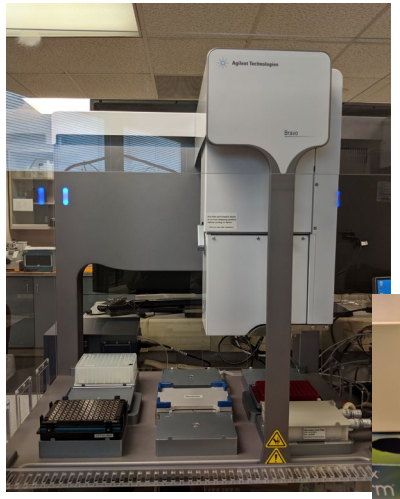
Capabilities

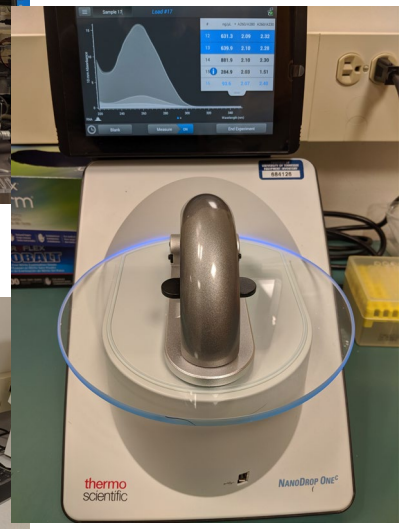
- Nucleic acid extraction
- Library preparations
- Sequencing (exome & custom cancer panels)
- **Robust Informatics platforms** [LIMS, LORA (UT designed)]

Specimen registration

Specimen tracking

Computational analysis





Accomplishments

- 475 Custom cancer panels

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THE UTHSC COVID-19 TEST:
RAPIDLY REPURPOSING A CANCER TRANSLATIONAL AND HISTOLOGY LABORATORY TO A HIGH THROUGHPUT MOLECULAR SARS-CoV-2 TESTING FACILTY TO MEET THE NEEDS OF THE COMMUNITY IN A DEADLY PANDEMIC

- **TIMELINE**: Project day: 40 (April 22):
- March 13: Executive decision to bring the test to UTHSC
- March 15: Initiated planning for data collection for an FDA EUA submission using a CDC based test format, and testing expansion in an existing CLIA high complexity laboratory and compatible with State of TN laboratory regulations
- March 13-27: Design test and perform test validation: Preanalytical, analytic and post-analytical systems developed.
- March 27: First sample collection for testing at UT collection site
- March 30: First clinical sample testing performed; FDA notified of test initiation

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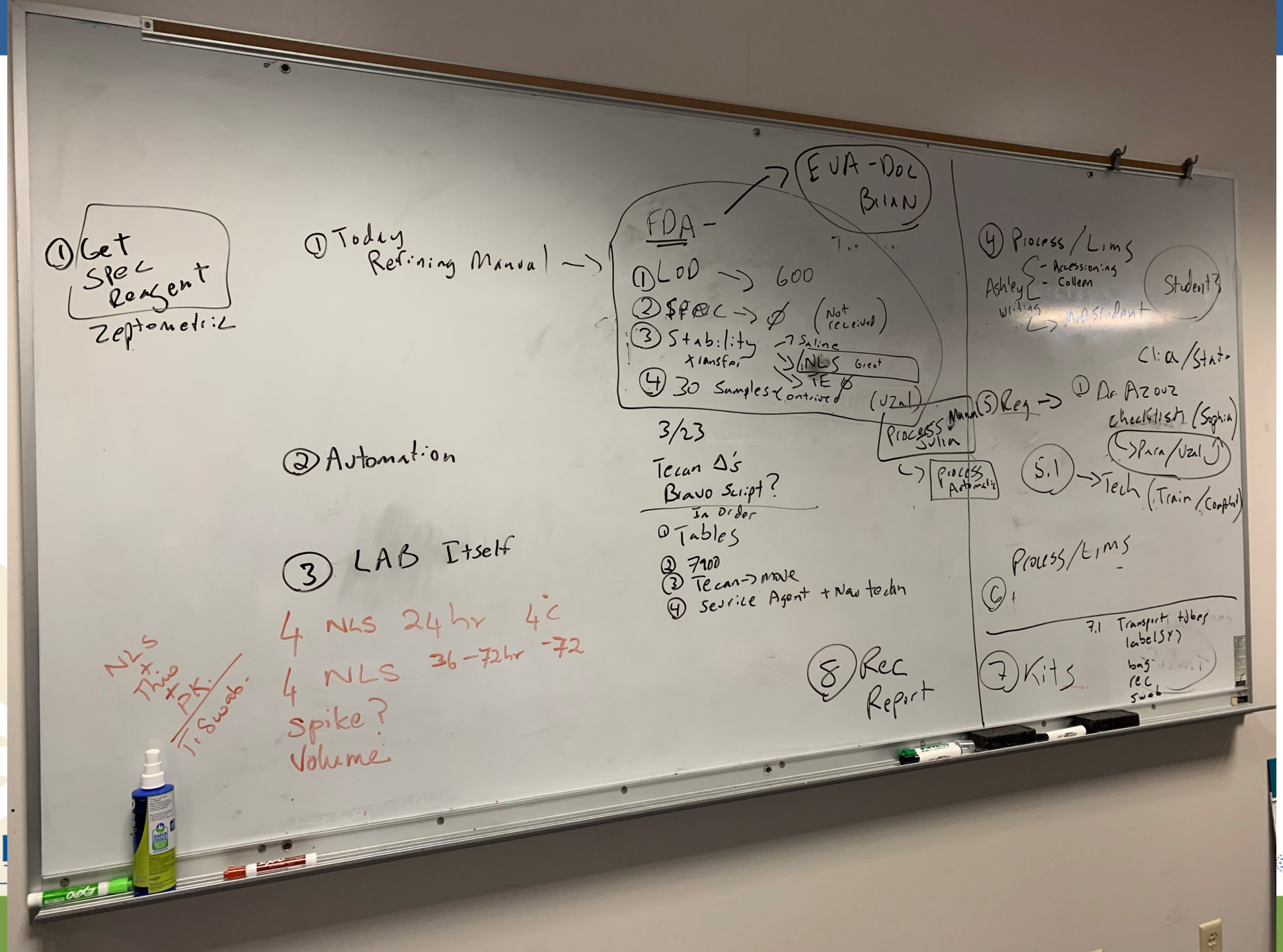
① Get Spec Reagent
Zeptometrix
① Today Refining Manual
FDA -
EUA - Doc Binn
① LOD → 600
② $PEC → ∅ (Not received)
③ Stability + transfer → Saline
NLS Great
TE ∅
④ 30 Samples (Control)
(Uzal)
Process Julia
3/23
Tecan Δ's
Bravo Script?
In order
① Tables
② 7900
③ Tecan → move
④ service Agent + Nav to chn
② Automation
③ LAB Itself
4 NLS 24hr 4°C
4 NLS 36-72hr -72
Spike?
Volume
NLS + Thio + PK.
/ Tr Swab.
⑧ Rec Report
④ Process / Lims
Ashley - Accessioning
- Colleen
writing
Student?
Clia / Staff
⑤ Reg →
① Dr. Azouz checklists (Sophia)
→ Para / Uzal
Process Automation
5.1 → Tech (Train / Confirm)
Process / Lims
⑥
7.1 Transport tubes labels (x)
bags
rec
swab
⑦ Kits


Agilent
No Signal
HDMI2/DVI
(1) Check the cable connections and the settings of your source device.
(2) Press SOURCE on your remote to select connected source device.
BIOHAZARD


Wilsonart
741

WOMEN'S HEALTH LABORATORIES

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WOMEN'S HEALTH LABORATORIES

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UroPath DIAGNOSTICS

WOMEN'S HEALTH LABORATORIES

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WOMEN'S HEALTH LABORATORIES

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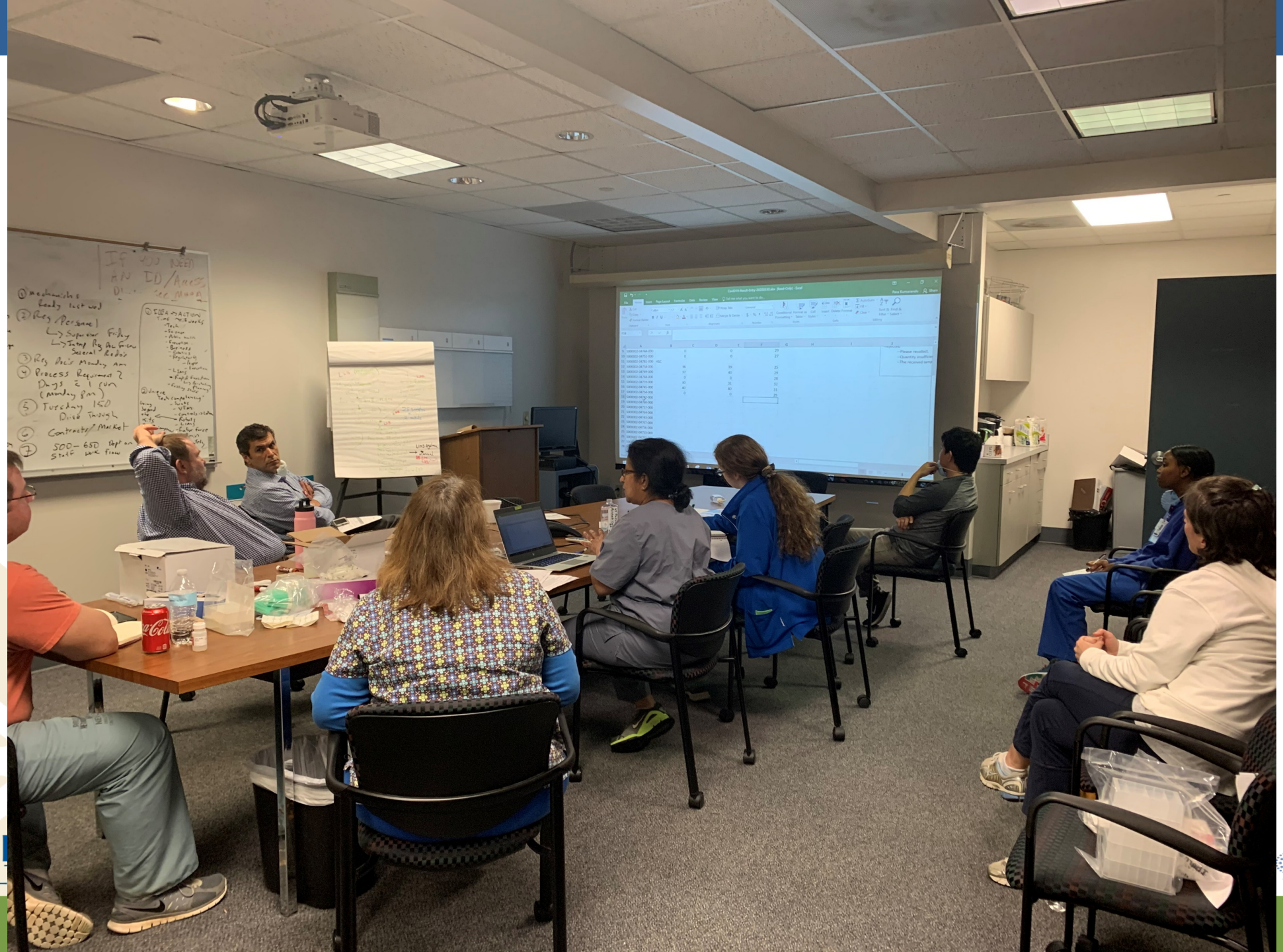

WOMEN'S HEALTH LABORATORIES

THE UTHSC COVID-19 TEST:

- Week of March 30th: Resulted our first CLINICAL tests (within 15 days of project initiation) and since April 1, UT Lab has performed all testing on samples collected at Liberty Bowl/Tiger Stadium UTHSC collection site.
- Week of April 9: Worked out experimental conditions, automation programming for the high throughput automation and more efficient processes
- Week of April 13: Began evaluation of automated testing in human specimens, logistics, compliance, regulatory, supply chain, training personnel and required mandated validation for a separate and unique EUA submission.
- Week of April 20: Develop and offer automation of up of 1000-1500 test


HALYARD
MANUFACTURED IN CANADA
ETOBICOKE, ONTARIO, CANADA M9W 6Y3

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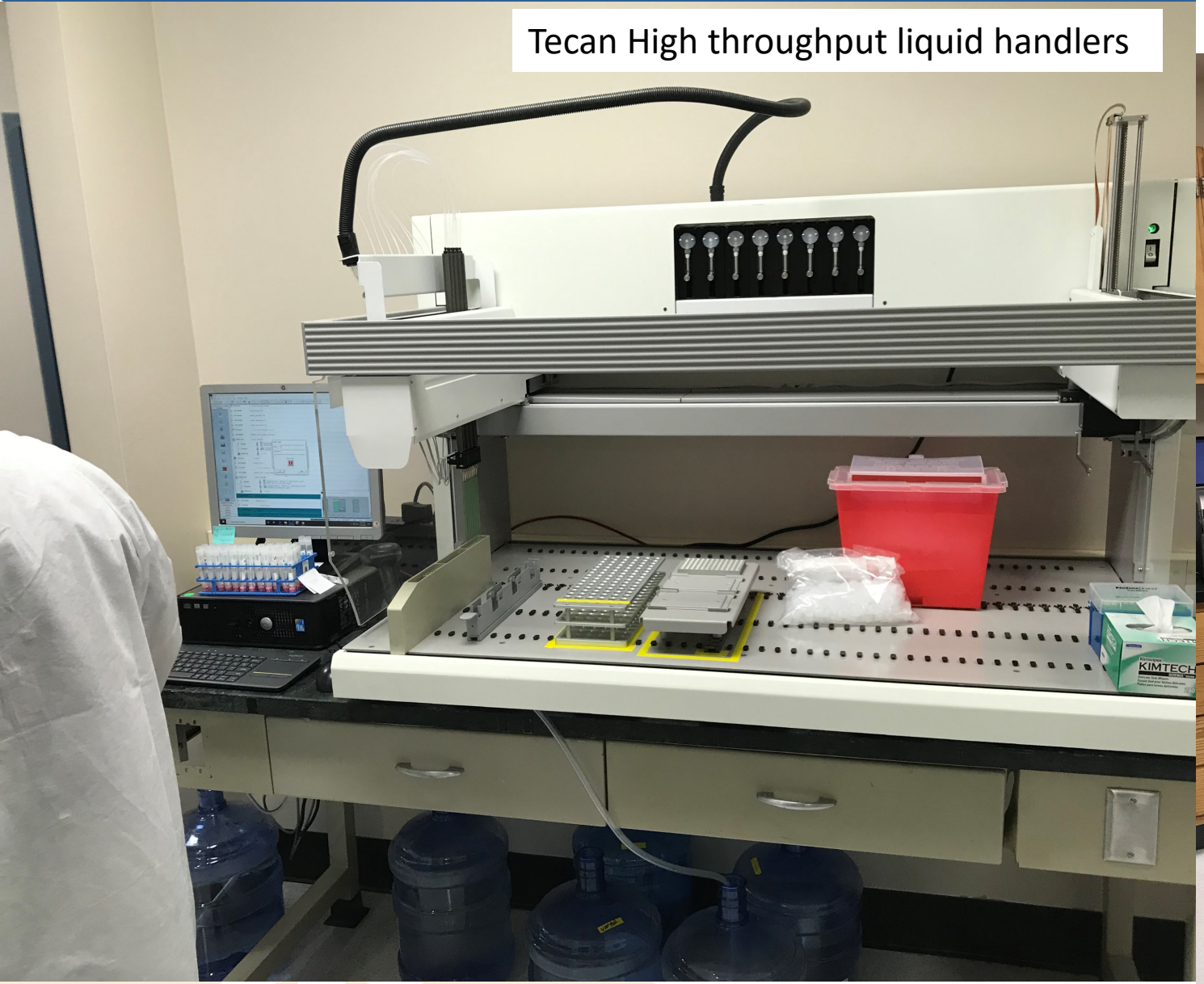
BSL2 for virus inactivation

Tecan High throughput liquid handlers



Bravo for high throughput RNA isolation

POPLAR HEALTHCARE

D-PATH™ Dermatopathology

ABI7900 high throughput PCR instruments

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LOGISITCS

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D-PATH Dermatopathology

GI PATHOLOGY One Purpose. One Passion.

OncoMetrix Definitive Cancer Diagnostics

UroPath DIAGNOSTICS

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UT PATH

930 Madison Avenue, Suite 500
Memphis, TN 38103
901.866.8067 • Fax: 901.302.2067

Pathology Report

Patient Information	Specimen Information	Physician Information
Name: John Doe **Address:** 123 Main St Memphis, TN 38103 **Phone:** 901-555-1234 **DOB:** 7/4/1976 **Gender:** M	**Specimen ID:** S000002-99999-000 **Order#:** 9876ZXY **Collected:** 4/6/2020 **Received:** 4/7/2020 **Reported:** 4/7/2020	**Dr. David Schwartz** 1407 Union Ave. STE 700 Memphis, TN 38104 (901) 209-9678

Ordered Items:
U697 - COVID 19 SARS-COV-2 LR *

Results:

U697 - COVID 19 SARS-COV-2 LR *	Not Detected
Comment:	

*This test was developed and its performance characteristics determined by University of Tennessee Clinical Health and University of Tennessee Health Science Center . This test has not been FDA cleared or approved. This test has been authorized by FDA under an Emergency Use Authorization (EUA). This test has been validated in accordance with the FDA's Guidance Document (Policy for Diagnostics Testing in Laboratories Certified to Perform High Complexity Testing under CLIA prior to Emergency Use Authorization for Coronavirus Disease-2019 during the Public Health Emergency) issued on February 29th, 2020. FDA independent review of this validation is pending. This test is only authorized for the duration of time the declaration that circumstances exist justifying the authorization of the emergency use of in vitro diagnostic tests for detection of SARS-CoV-2 virus and/or diagnosis of COVID-19 infection under section 564 (b) (1) of the Act, 21 U.S.C. 360bbb-3 (b) (1) , unless the authorization is terminated or revoked sooner.

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Ordered Items:
U696 - COVID 19 SARS-COV-2 HR *

Results:

U696 - COVID 19 SARS-COV-2 HR *	DETECTED
Comment:	

*This test was developed and its performance characteristics determined by University of Tennessee Clinical Health and University of Tennessee Health Science Center . This test has not been FDA cleared or approved. This test has been authorized by FDA under an Emergency Use Authorization (EUA). This test has been validated in accordance with the FDA's Guidance Document (Policy for Diagnostics Testing in Laboratories Certified to Perform High Complexity Testing under CLIA prior to Emergency Use Authorization for Coronavirus Disease-2019 during the Public Health Emergency) issued on February 29th, 2020. FDA independent review of this validation is pending. This test is only authorized for the duration of time the declaration that circumstances exist justifying the authorization of the emergency use of in vitro diagnostic tests for detection of SARS-CoV-2 virus and/or diagnosis of COVID-19 infection under section 564 (b) (1) of the Act, 21 U.S.C. 360bbb-3 (b) (1) , unless the authorization is terminated or revoked sooner.

UT Path CLIA# 44D2090400, Abdallah Azouz, MD, Laboratory Director

Complex testing and operational capability from ground zero in such a short timeframe: Perfect coming together and smart use of some key existing strengths

- ***High throughput robotics*** used for high throughput DNA sequencing of hundreds and thousands of genes is repurposed rapidly and validated for high throughput automated viral assay output of around 1000 tests per day.
- **State of the art lab information management system (LIMS)** for the cancer translational lab funded by Cancer Research Institute is used throughout the testing cycle from requisition to the many steps of testing and reporting.
- **Research and Development (Scientific) team:** The molecular translational lab team has several years' experience (prior to arrival here at UTSHC) developing and performing over 10,000 unique molecular high throughput assays (and 20M individual tests) have patents in the area.
- **UTHSC Regional Biocontainment Laboratory:** one of few in the state, we have had access to live CoV2 virus (handled in their BSL-3 research facility) and viral RNA for validation of tests and running appropriate controls.

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Complex testing and operational capability from ground zero in such a short timeframe: Perfect coming together and smart use of some key existing strengths

- **Clinical Deployment team:** Experienced lab leadership with decades of cumulative experience in test deployment, medical and scientific directorship of clinical labs, including microbiology and molecular labs.
- **Clinical, University and hospital partners:** UCH and UTHSC personnel, medical students, residents, research PhDs, Medical Laboratory Scientists from partner clinical laboratories.
- **Team commitment** with high clinical and academic standards **with a can-do attitude** and to do whatever it takes to make a difference in a global pandemic.

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Overarching Value Summary

- ***Unique UTHSC Lab Developed FDA, CLIA, and Tennessee compliant test performed using standardized CDC molecular targets, with high throughput capacity, likely greater sensitivity, 24 hours resulting, serving community and partner hospitals, with a comprehensive process that could impact public health and medical care decision-making for our city and paving the way for new research avenues , discovery and innovation.***

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DEVELOP SEROLOGIC TESTING

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SEROLOGIC TESTING

- Invaluable complement to PCR testing for COVID19
- STRATEGICALLY: to offer full range of COVID19 lab testing at UTHSC
- Offer a UTHSC (scientists at UTHSC) developed novel serologic test
- Leverage the capabilities of our evolving and transformed clinical lab at 930 Madison building
- Clinically onboard commercially available test on existing platforms at partner hospitals of Regional One Health and MLH hospitals

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PARTICIPATE IN CORONAVIRUS CONVALESCENT PLASMA PROGRAM

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ROLE IN CORONAVIRUS CONVALESCENT PLASMA PROGRAM CCP

- Use of convalescent plasma has been studied in other respiratory infections, such as the 2003 SARS-CoV-1, 2009 H1N1, and 2012 MERS-CoV epidemics & other serious epidemics such as Ebola
- UTSHC transfusion pathologists play at active role at Regional One Health and all MLH hospitals as a team identifying donors and matched convalescent plasma
- First two patients are ready for CCP this week
- ale don[illegible]ae have not
- SARS-C[illegible]utralizing an

ROLE IN CORONAVIRUS CONVALESCENT PLASMA PROGRAM

- DONOR AWARNESS EFFORTS

- individuals who have previously tested positive

- You may help save a life of someone with symptomatic advanced coronavirus illness

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PUBLIC HEALTH REPORTING

&

FACILITATING PREDITICTION MODELS

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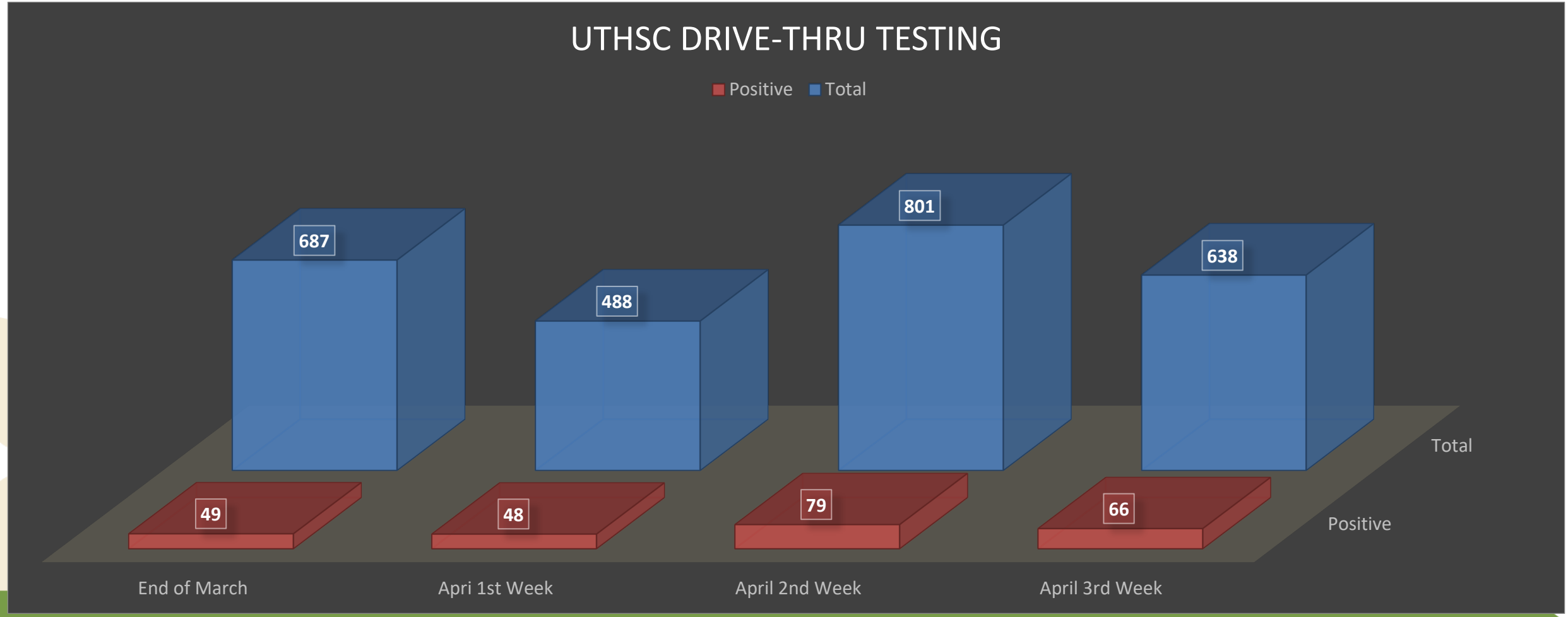
State and County Health Department Reporting

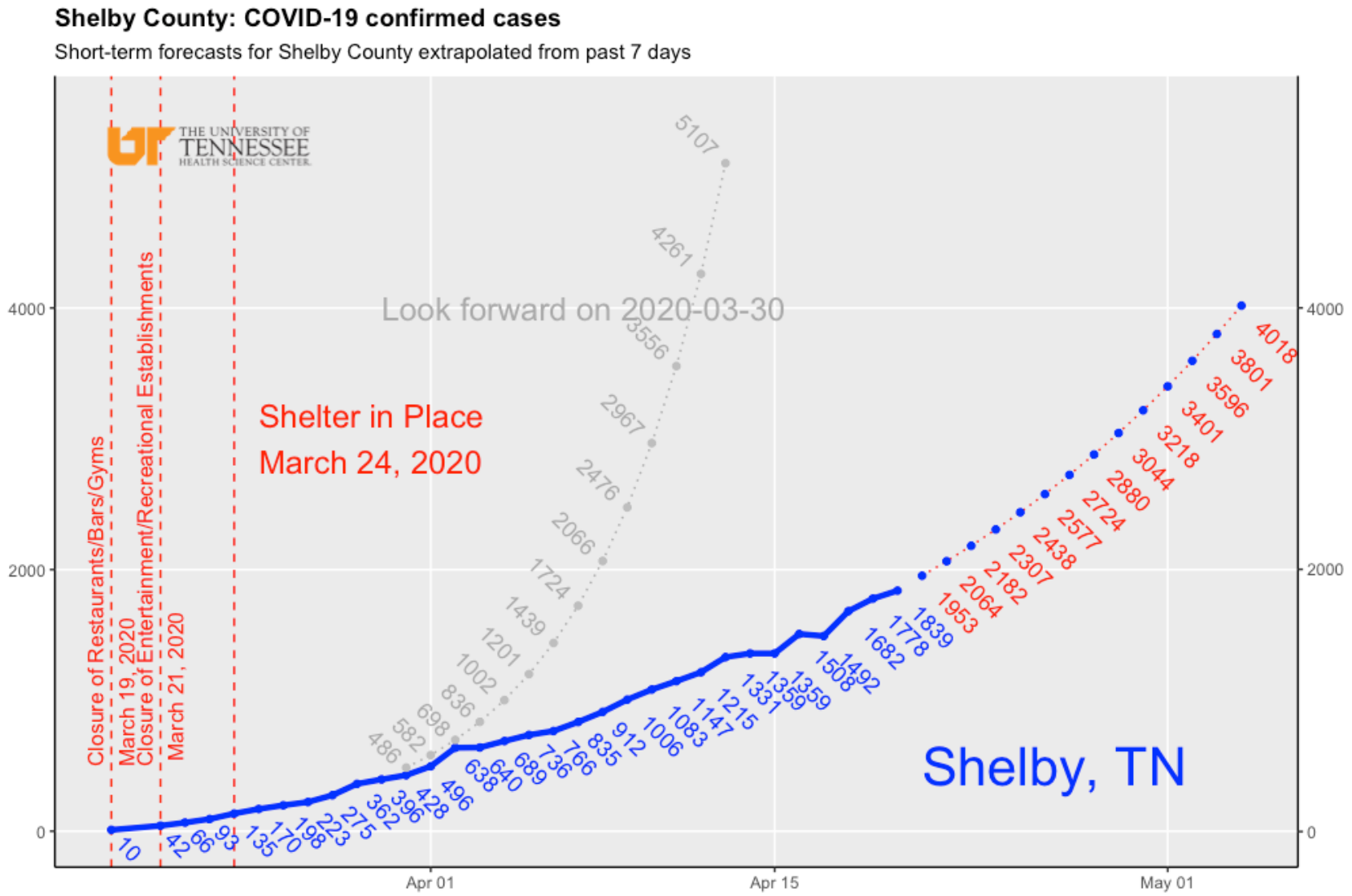


CURRENT NUMBERS

- UTHSC Community Drive
  - Negative – 1934
  - Positive – 214
  - Presumptive Positive – 186
  - Total – 2334
  - Percent Positive – 17.14%
- Cumulative:
  - Negative – 8124
  - Positive – 923
  - Presumptive Positive – 216
  - Total – 9263
  - Percent Positive – 12.29%

The number of days until no. of cases double is an essential measure of how fast the virus spreads

We were doubling numbers every 4 days, currently about every 12 days

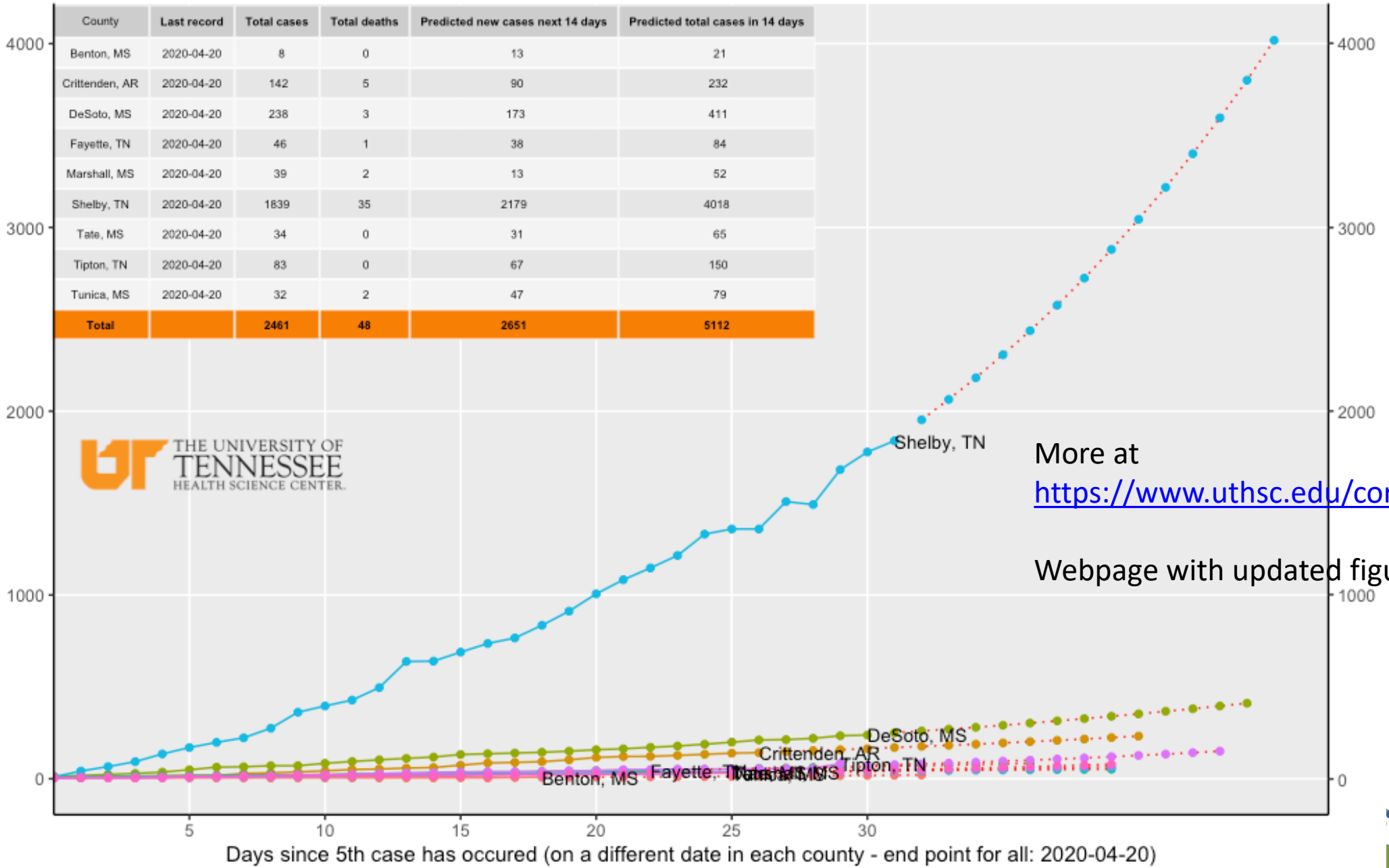


Source: Data from Johns Hopkins University (github; accessed Tue Apr 21 16:46:06 2020); UTHSC College of Medicine | Preventive Medicine | Biostatistics.

Memphis Metropolitan Area: COVID-19 confirmed cases trajectories by county

Short-term forecasts for each county extrapolated from past 7 days in that county

County	Last record	Total cases	Total deaths	Predicted new cases next 14 days	Predicted total cases in 14 days
Benton, MS	2020-04-20	8	0	13	21
Crittenden, AR	2020-04-20	142	5	90	232
DeSoto, MS	2020-04-20	238	3	173	411
Fayette, TN	2020-04-20	46	1	38	84
Marshall, MS	2020-04-20	39	2	13	52
Shelby, TN	2020-04-20	1839	35	2179	4018
Tate, MS	2020-04-20	34	0	31	65
Tipton, TN	2020-04-20	83	0	67	150
Tunica, MS	2020-04-20	32	2	47	79
Total		**2461**	**48**	**2651**	**5112**



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"Re-opening" will require monitoring to avoid hospital overloads

More at https://www.uthsc.edu/coronavirus

Webpage with updated figures etc. coming soon!

Source: Data from Johns Hopkins University (github; accessed Tue Apr 21 16:46:06 2020); UTHSC College of Medicine | Preventive Medicine | Biostatistics.

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FACILITATE FUTURE RESEARCH

Enabling Research – IRB

- Leveraging Cancer Research Institute biobanking protocols and personnel, IRB compliant research protocols for genomic and other relevant research questions.

Summary:

- Unfortunate international pandemics, such as the current coronavirus infection, provide an accelerated opportunity for Pathology and Lab Medicine professionals and personnel to play a pivotal role in the care of those affected by the virus
- The role extends beyond diagnostic and clinical service needs: it should be ideally comprehensive and meets the needs of the medical community and the society we serve: such as we have humbly attempted to do.

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THANK YOU

- Vice Chancellor Brown, Dean Strome, Dr. Jon McCullers
- Partners at UT, UTHSC, UCH, medical school and GME program
- Pathologists, PhDs and Lab personnel working round the clock on the effort
- Physicians, patients and community who inspire us to bring out the best in us.

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Questions?

cls@uthsc.edu

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Thank You!

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