



THE  
FRANCIS  
CRICK  
INSTITUTE



Imperial College  
London



CANCER  
RESEARCH  
UK

# The technological response to a global pandemic



- The Francis Crick Institute COVID19 consortium diagnostic pipeline.

Presented by Karen Ambrose  
Research Data Services/Database Team Lead  
The Francis Crick Institute, London, UK





# The Francis Crick Institute

THE  
FRANCIS  
CRICK  
INSTITUTE

A biomedical discovery institute researching the fundamental biology of health and disease.

Located in the heart of Kings Cross in central London, UK.

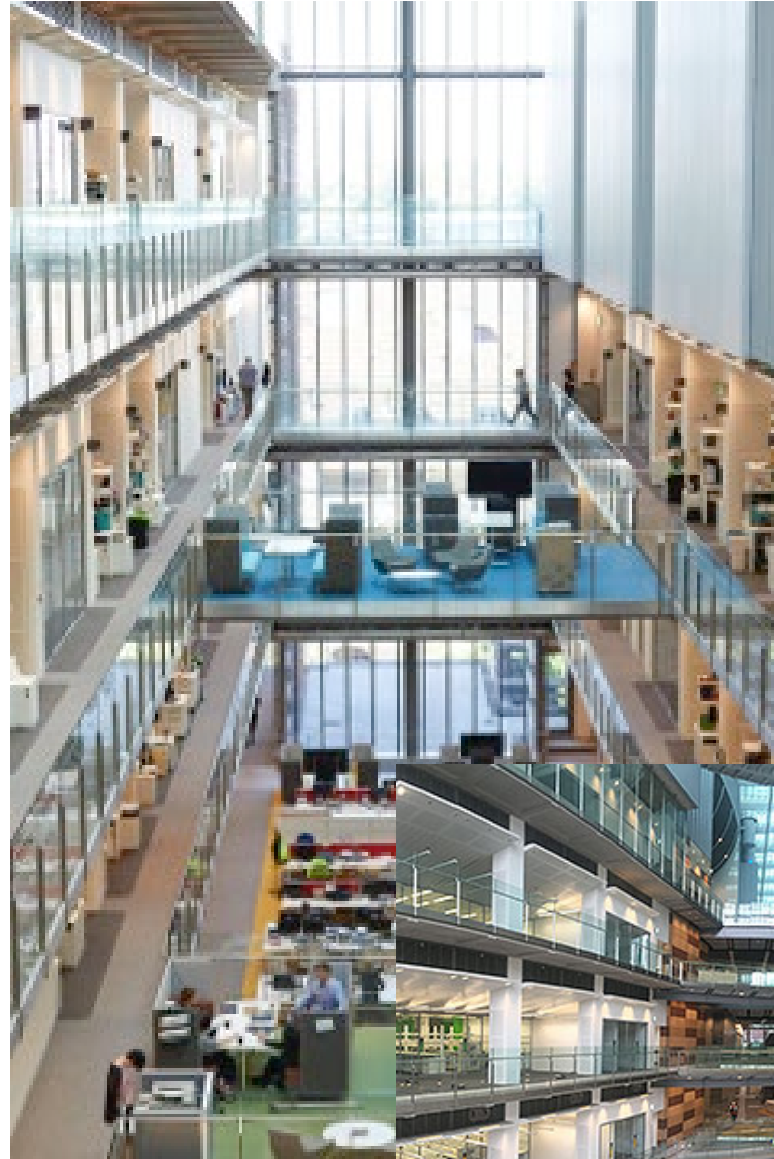
1500 scientists and support staff working collaboratively in science, technology, engineering and maths (STEM) disciplines.

Europe's largest biomedical research facility under a single roof when opened in 2016.



# The Crick in numbers

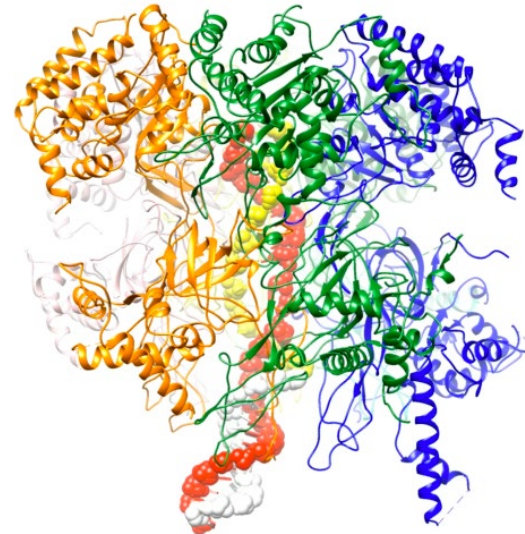
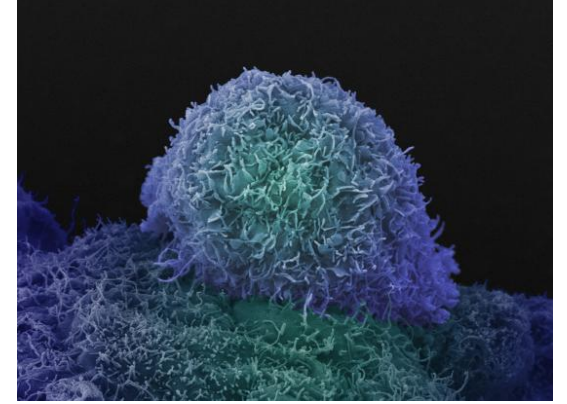
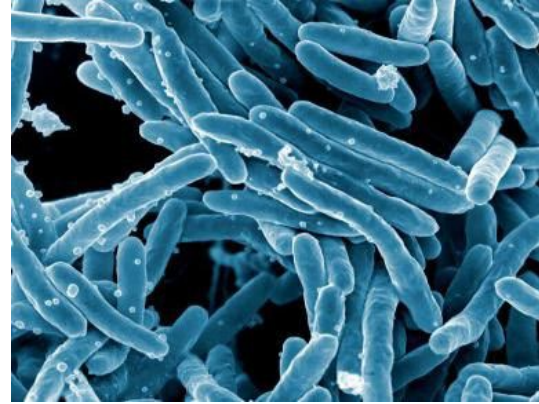
- 1250 Scientists across >120 Research Groups & Science Technology Platforms
- 250 Operations Staff
- Over 30,000 pieces of Scientific equipment
- 12 Floors (4 below ground), 1533 Rooms - designed to encourage collaboration
- 70+ nationalities
- 2 active Nobel Prize winners!



# “Discovery without boundaries”

7 Core research areas:

- Growth and development
  - Health and ageing
  - Human biology
  - Cancer
  - Immune system
  - Infectious disease
  - Neuroscience
- 
- Translate discoveries into new ways to prevent, diagnose and treat disease

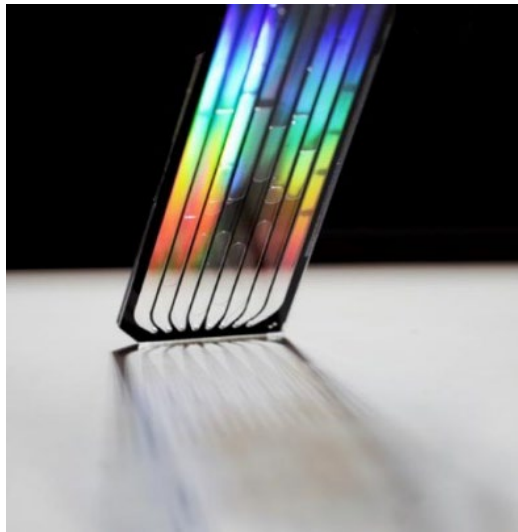
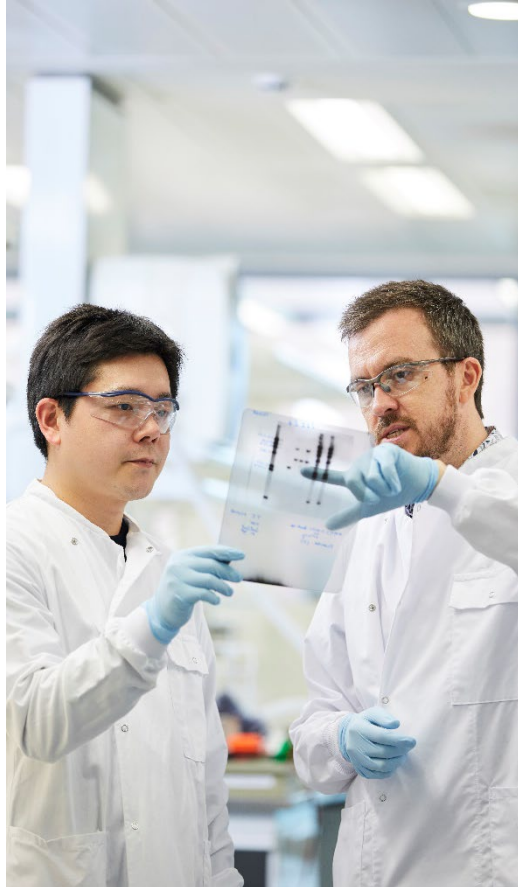


# Facilities at the Crick

Over 100 research groups investigating Covid to cancer, influenza to the immune system.

16 Central facilities, Science Technology Platforms (STP) support all groups, for example:

- Light & Electron Microscopy
- Protein analysis
- Advanced Sequencing
- Bioinformatics & Biostatistics
- Scientific Computing
- ...





**Karen Ambrose**

# A little bit about me



Research Data Services/Database Team Lead at the Francis Crick Institute.

Over 6 years of experience at the Crick.

Worked on the Human Genome Project at the Wellcome Sanger Institute, Cambridge, UK

Advocate for equality:

- Chair of PRISM, Race Equity staff network
- Member of the Athena Swan Steering Committee
- Lead for the Race Equality Charter Group

# Background to the Crick COVID19 Consortium



- Started on 19th March 2020.
- Collaboration between University College London Hospitals, Health Services Laboratory (HSL), the Institute of Cancer Research and the Francis Crick Institute.
- A high throughput RT-PCR COVID19 diagnostics assay was set up in 2 weeks.
- Diagnostic pipeline was operational by April 2020, through on-site and virtual working.
- The Crick's diagnostic pipeline works as an extension of the accredited laboratories at HSL.
- The aim has been to
  - minimise dependencies on reagents, in short supply globally,
  - to provide resilience to the pipeline and
  - provide a scalable platform to screen hundreds to thousands of healthcare workers and patients per day.



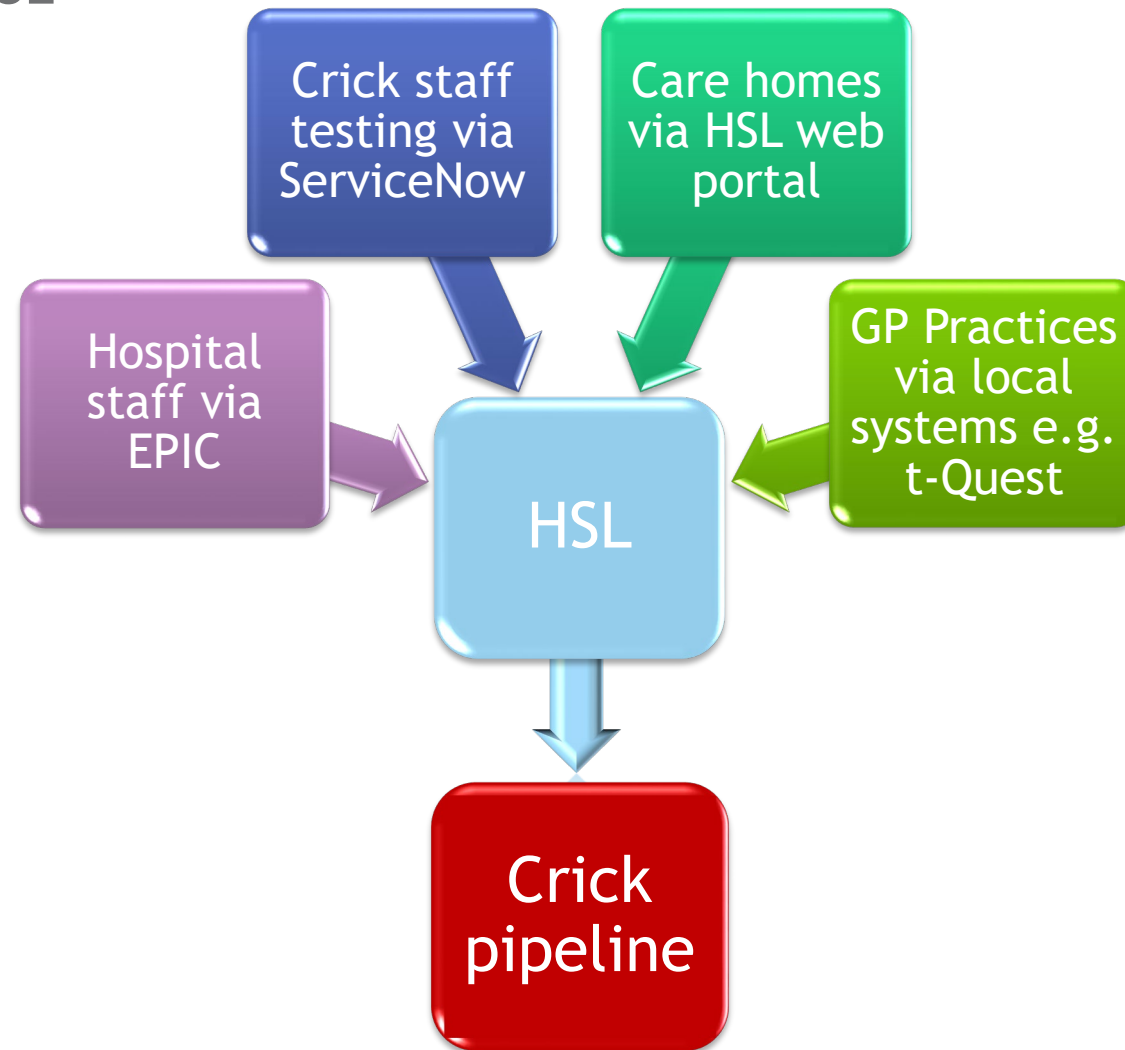
# Quote from Sir Paul Nurse, Director of the Crick in light of the Coronavirus (COVID19) response.

*“Testing is an essential part of the national effort to tackle the spread of COVID-19. We wanted to use our facilities and expertise to help support NHS staff on the front line who are battling this virus”*

*“Institutes like ours are coming together with a Dunkirk spirit - small boats that collectively can have a huge impact on the national endeavour.”*

# Challenge: How to extend testing access?

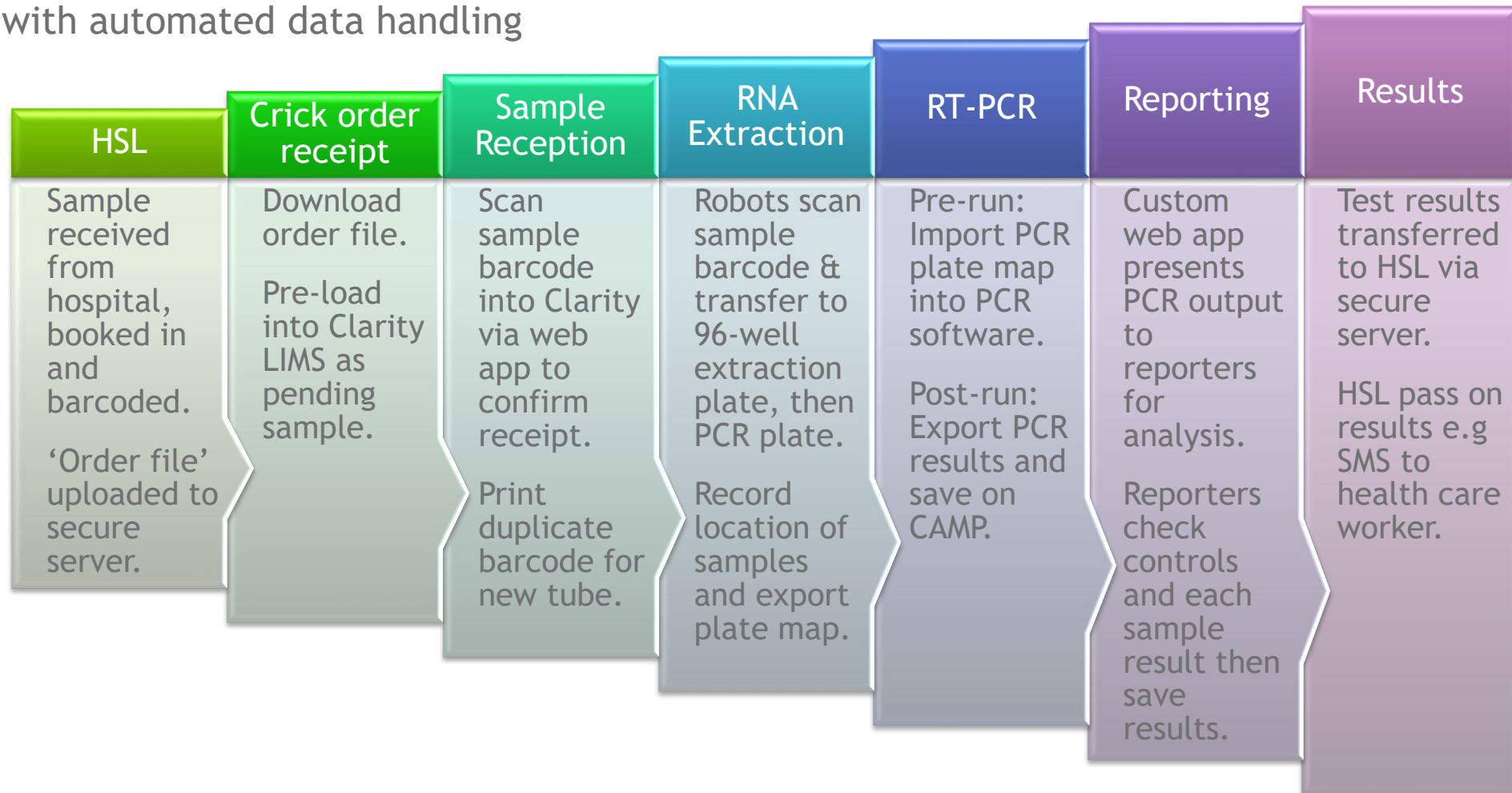
Solution: Work with HSL to interface with existing systems - one size does NOT fit all!



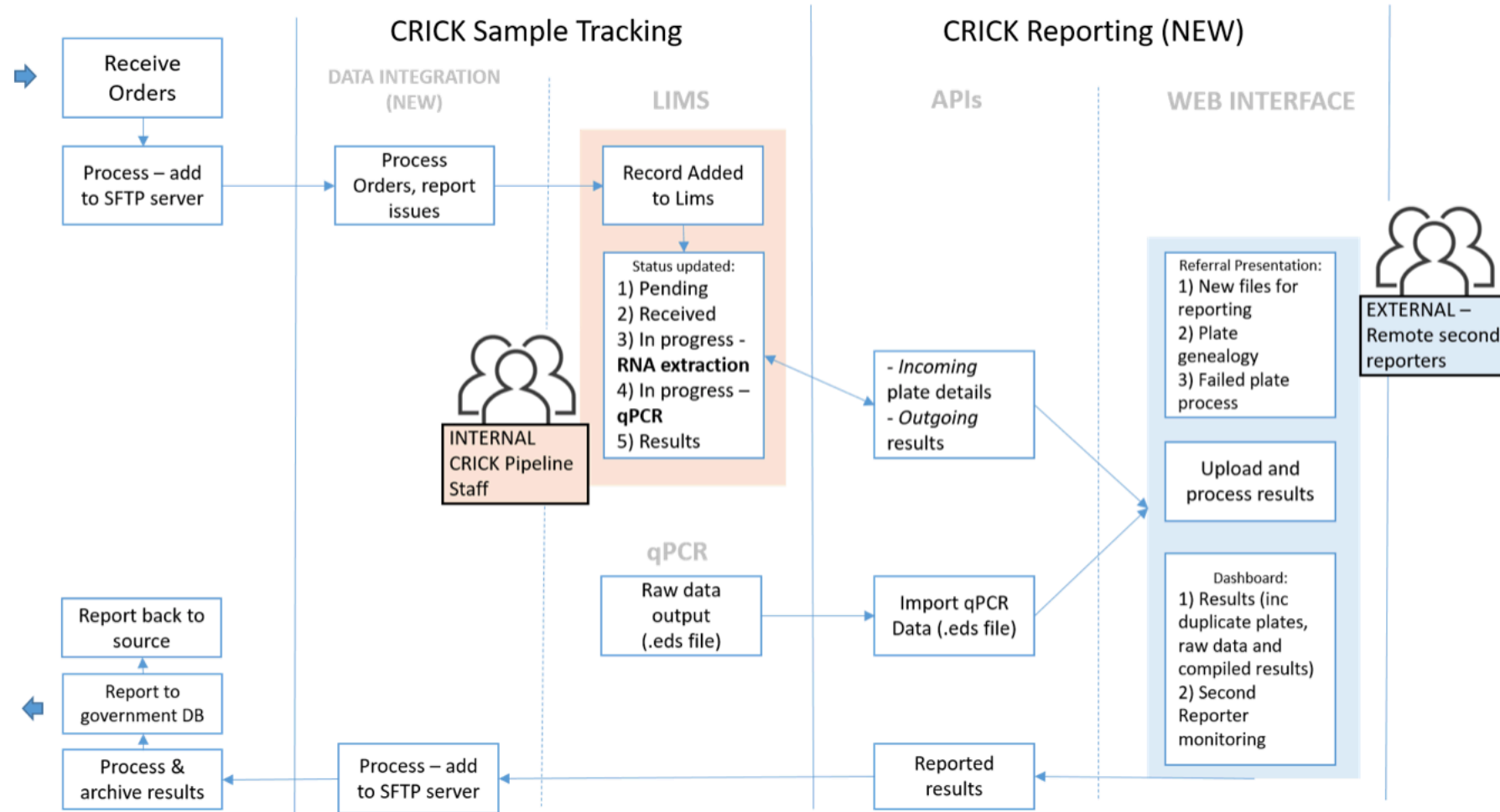
# Crick Sample tracking pipeline (simplified!)

**Challenge:** Ensure end-to-end data integrity

**Solution:** All samples and plates are barcoded and tracked through the testing pipeline with automated data handling

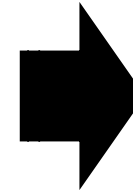
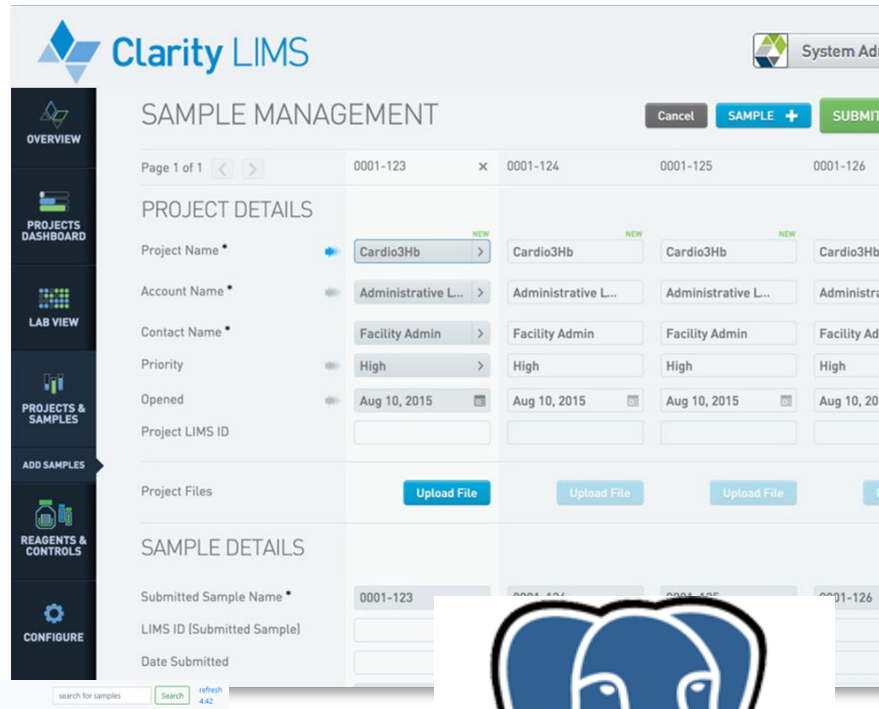


# COVID-19 PCR pipeline - sample tracking & reporting



# In-house Technology under the hood

Sample reception, management & tracking.



RNA deactivation and extraction.

CRICK COVID-19 RNA TEAM STATUS PAGE

PCR Machine Availability

machine_1	machine_2	machine_3	machine_4	machine_5	machine_6
Available	Available	Available	Available	Available	Available
		machine_7	machine_8		
		Available	Available		

Consolidation  
Incoming samples! (this number includes repeats)  
PM Samples scanned in 2020-10-13

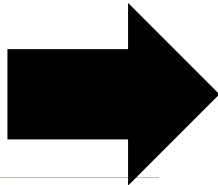
RNA Extraction  
Queued for extraction  
1. Container name: LFL02911  
Date Scanned: date: 2020-10-13  
hour: 19:00

RT-qPCR Aliquoting  
Ready for RT-qPCR Aliquoting

HTS Plate Collection  
Plates ready for RT-qPCR



# In-house Technology under the hood



RT-PCR diagnostic assay.

CCR - Crick COVID-19 Referrals

staging-rportal.theccr.org/referrals/dashboard/

PCR

Validations listing Dashboard Logout

### Results Dashboard

(paired/processed referrals only)

Thank you for your support with COVID-19 testing

Enter plate ID or sample name

Name/Plate	Extraction container	Imported at	Validator	Validated at	Processed?	Summary
<a href="#">CFH196YZ</a> Full details	SPL00319	13 Oct - 10:35	ccr_su_admin	13 Oct - 11:42	YES	POS (0): NEG (82): A1 A2 A4 A5 A6 A7 A8 A9 A10 A11 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 FAIL/INVALID (5): A12
<a href="#">CFH196Z2</a> Full details	SPL00319	13 Oct - 10:35	ccr_su_admin	13 Oct - 11:43	YES	
<a href="#">CFH196Y</a> Full details	SPL00317	13 Oct - 10:35	ccr_su_admin	13 Oct - 11:45	YES	
<a href="#">CFH196Z1</a> Full details	SPL00317	13 Oct - 10:35	ccr_su_admin	13 Oct - 11:47	YES	

CCR - Crick COVID-19 Referrals

staging-rportal.theccr.org/referrals/146/dashboard-detail/

### CFH196YZ

Back to dashboard

Thank you for your support with COVID-19 testing

#### Referral details

Plate	CFH196YZ	POS	0
Extraction container name	SPL00319	NEG	82
Extraction date	23 May 2020, 8:11 p.m.	FAIL/INVALID	1
Imported at	13 Oct 2020, 10:35 a.m.	INCOMPLETE	0
Validator	ccr_su_admin	IGNORED (blank/control sample names)	2
Validated at	13 Oct 2020, 11:42 a.m.		

#### Well results

[Open/close well result view](#)

#### Genealogy data

[Open/close plate genealogy view](#)

#### Re-download data

Primary EDS file Download the file using the button below.	Reporter2 EDS file Uploaded during the validation process	Reporter2 XLS file Uploaded during the validation process
<a href="#">Download file (.eds)</a>	<a href="#">Download file (.eds)</a>	<a href="#">Download file (.xls)</a>

Reporting and results

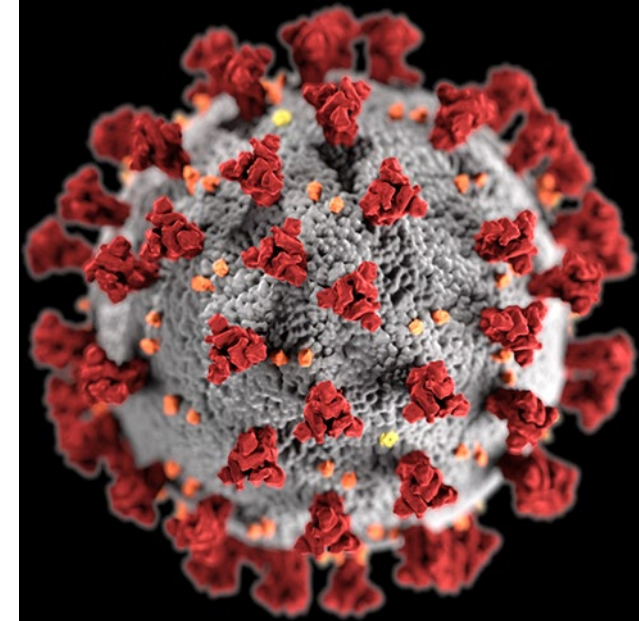
# Current status and Future plans

## Current status:

- 150K + sample processed to date.
- 50 people working on the pipeline at any one time and 300+ people involved in supporting the pipeline to date since March 2020.
- Implemented Crick staff testing.
- <24 hour turnaround time.

## Future Plans:

- Pipeline review of steps to increase capacity.



# Additional information

- From the Crick website: <https://www.crick.ac.uk/research/covid-19/covid19-consortium>
  - Consortium background information.
  - Crick answering key questions about the virus - scientific information page (public engagement)
  - Standard operating procedures (SOP's) for the steps in the pipeline.
- Publication:
  - **Scalable and Resilient SARS-CoV-2 testing in an Academic Centre**  
[:https://www.medrxiv.org/content/10.1101/2020.04.19.20071373v3](https://www.medrxiv.org/content/10.1101/2020.04.19.20071373v3)
- The Crick consortium has shared our testing protocols with,
  - Cancer Research UK,
  - NHS England and
  - the Department for Health and Social Care



# Acknowledgements

- Big thanks to the staff at,

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 HEALTH SERVICES  
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**ICR** The Institute of  
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London Hospitals  
NHS Foundation Trust



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[crick.ac.uk](http://crick.ac.uk)