



An Overview of The Irish Coronavirus Sequencing Consortium

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Who? Irish Coronavirus Sequencing Consortium

Teagasc (Moorepark, Grange and Oak Park)

The National Virus Reference Laboratory

University College Cork

Cork University Hospital

University College Dublin

University Hospital Limerick

Beaumont Hospital

Trinity College Dublin

NUI Galway

NUI Maynooth

AIID Cohort (St Vincent's)

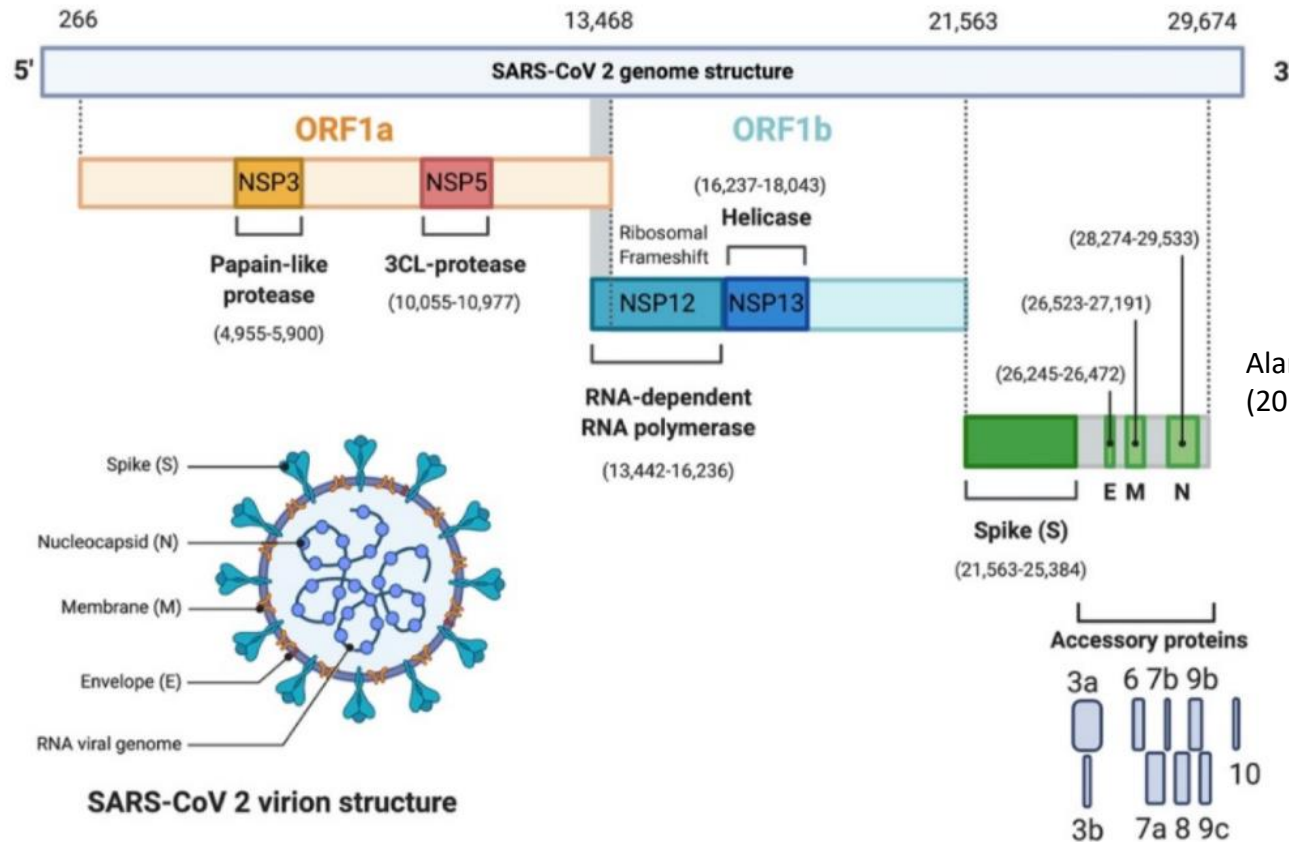
Genuity Ireland

Helixworks

- **They and their institutes are contributing time at no cost**
- **~2500 Sample will be analysed across the country**
- **To preserve anonymity, we only know gender, age and region**



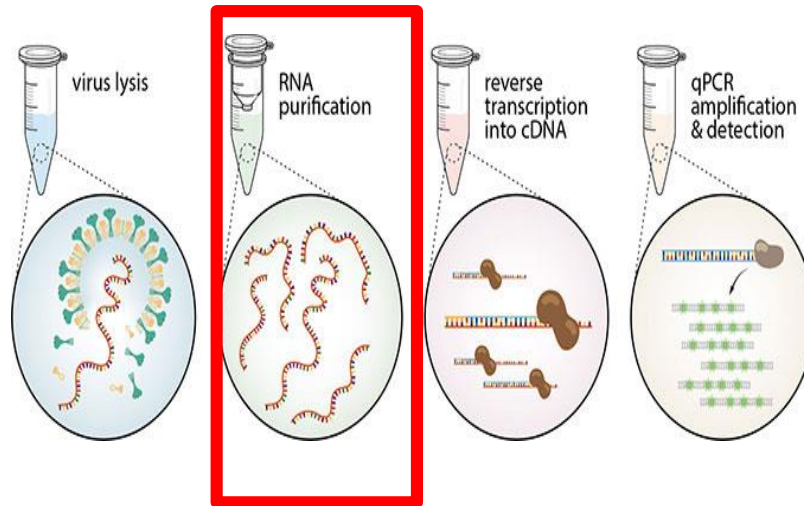
What? SARS-CoV-2 Genome



Alanagreh *et al.* Pathogens (2020)

- Why sequence the genomes?
We expect to see mutated versions (variants) of the virus develop

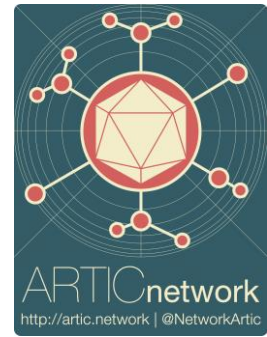
How?



Use surplus sample that had been collected for diagnostic testing for DNA sequencing.

We use the ARTIC Protocol for sequence data generation and analysis

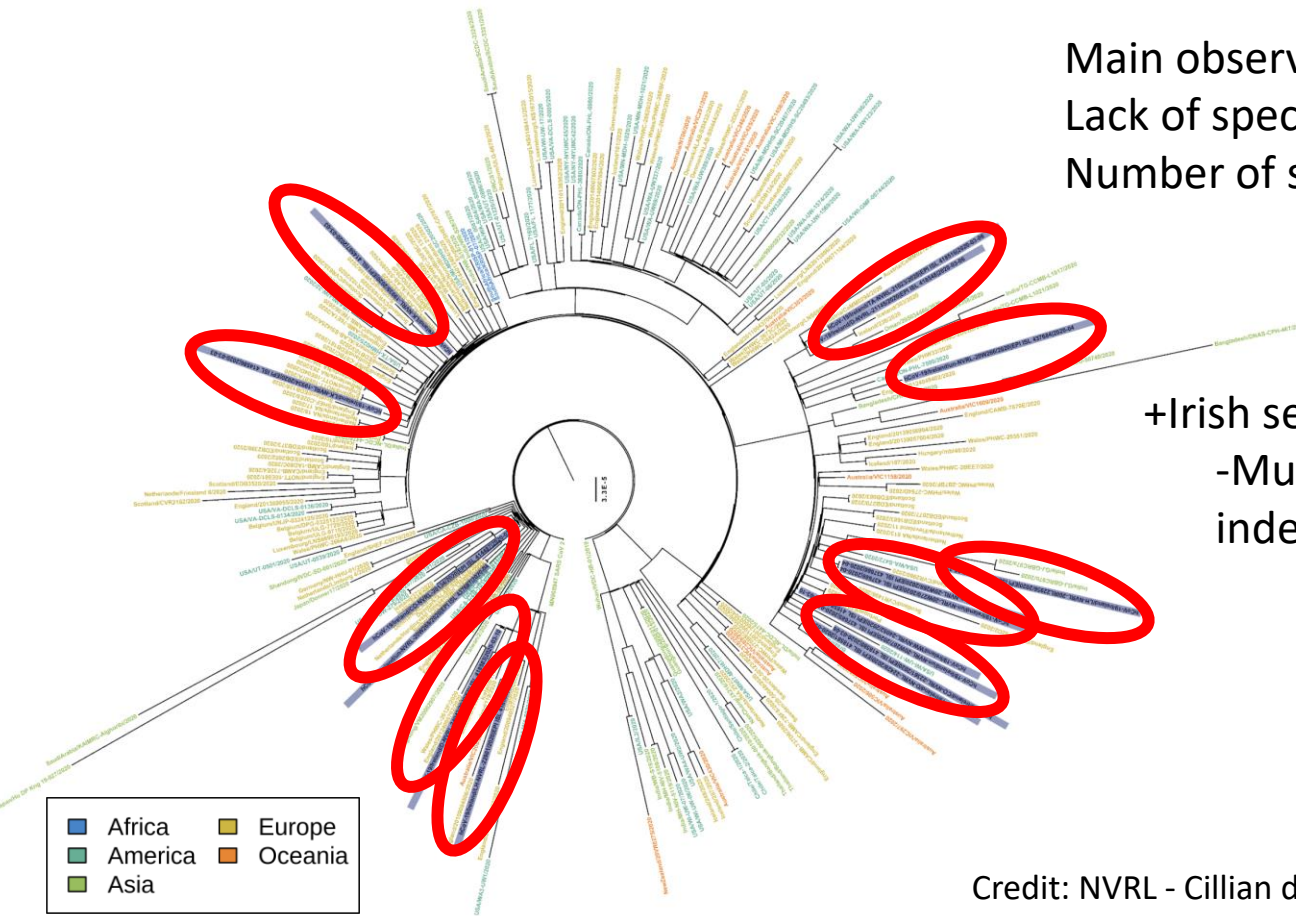
ARTIC



SARS-CoV-2

- Split the virus genome into small chunks
- Sequence those pieces and stick them back together using computing
- Gives us the mutation profile of the virus from the swabbed patient

Irish sequences compared to other sequences



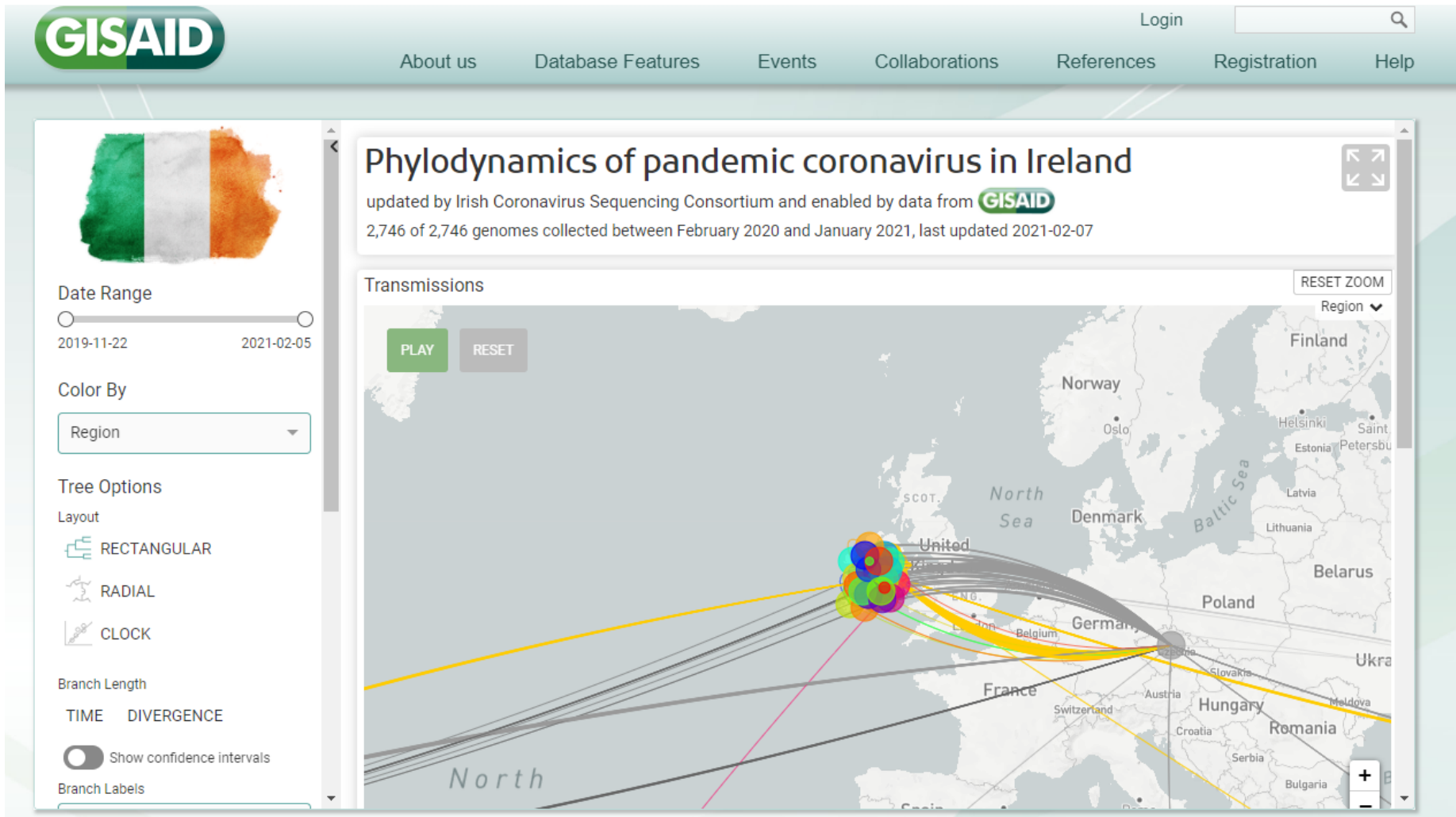
Main observations:

Lack of specific clusters per geography
Number of sequences biased to Europe

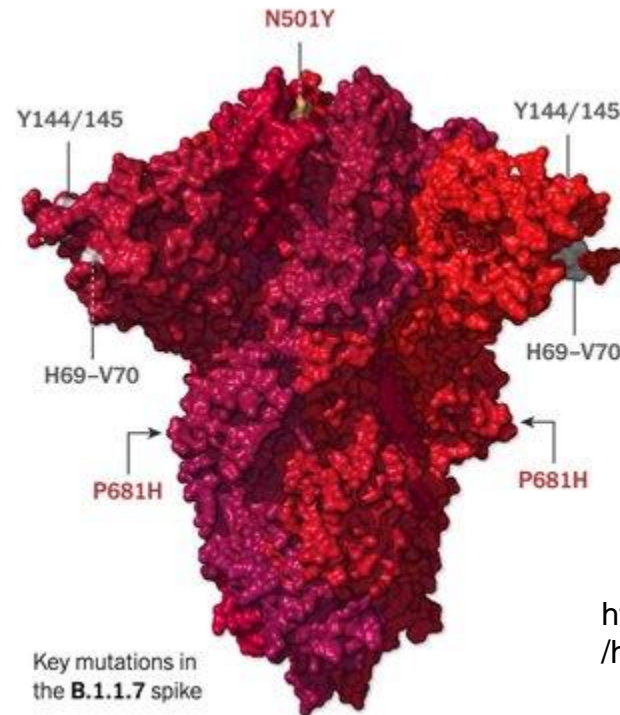
+Irish sequences (before June 25th)
-Multiple clusters suggest multiple independent introductions

Credit: NVRL - Cillian de Gascun; Michael Carr; Gabo Gonzalez

Variants vs. Time



Spike Protein Mutations



<https://www.nytimes.com/interactive/2021/health/coronavirus-variant-tracker.html>

- Mutations take place all the time.
- Our bodies apply a selection pressure.
- Selects for viruses which are better at infecting/transmitting.
- Evolution in action.

Samples From The All Ireland Infectious Disease Study

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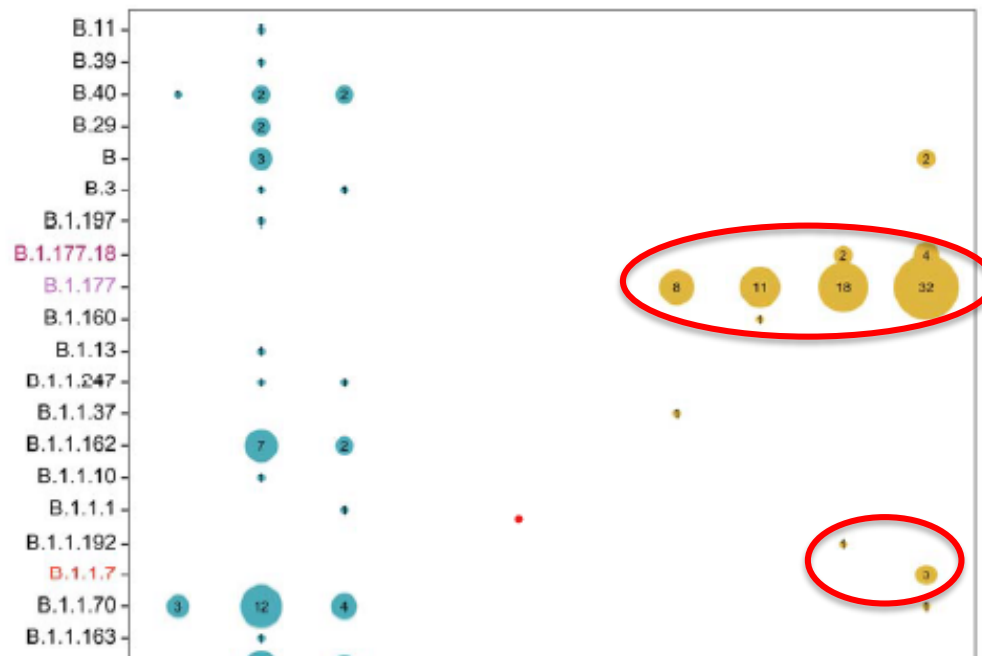
Whole-genome sequencing of SARS-CoV-2 in the Republic of Ireland during waves 1 and 2 of the pandemic

P.W.G. Mallon, F. Crispie, G. Gonzalez, W. Tinago, A.A. Garcia Leon, M. McCabe, E. de Barra, O. Yousif, J.S. Lambert, C.J. Walsh, J.G. Kenny, E. Feeney, M. Carr, P. Doran, P.D. Cotter

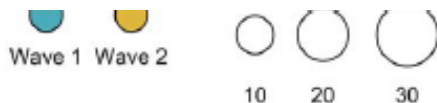
doi: <https://doi.org/10.1101/2021.02.09.21251402>

- The variants observed in the first and second wave in hospital patients are different
- Suggests the second wave of infections resulting in hospitalisations were largely seeded by multiple, travel-related events from countries outside of the island of Ireland.

Samples From The All Ireland Infectious Disease Study



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Summary

Use surplus sample that had been collected for diagnostic testing for DNA sequencing.

Nanopore sequencing for data generation and analysis.

New variants introduced into Ireland after the Summer likely seeded the subsequent infections and were detected in hospital patients.

Further Details

The screenshot shows the Teagasc website interface. At the top is a navigation bar with a menu (File, Edit, View, Favorites, Tools, Help) and the Teagasc logo (Agriculture and Food Development Authority). Below the logo are links for About, News & Events, Publications, and Contact. A search bar is also present. To the right are links for Teagasc Daily, Webinars, Apply Online, and Opportunities. A horizontal bar below the navigation links categorizes the site into Animals, Crops, Environment, Food, Rural Economy, and Education. The breadcrumb trail indicates the current location: Food > Research and Innovation > Research Areas > Food Bioscience > Irish Coronavirus Sequencing Consortium. On the left sidebar, a list of topics includes Fermented Foods, DNA Sequencing Facility, Food for Health, Milk Quality, and Irish Coronavirus Sequencing (which is highlighted in green). The main content area features the title 'Irish Coronavirus Sequencing Consortium' in green, followed by a paragraph describing the consortium's funding by the Science Foundation Ireland and its aim to sequence or 'read' the genetic information of SARS-CoV-2 to track its spread and potential effects on disease or treatment.

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Food > Research and Innovation > Research Areas > Food Bioscience > Irish Coronavirus Sequencing Consortium

Fermented Foods

DNA Sequencing Facility

Food for Health

Milk Quality

Irish Coronavirus Sequencing

Irish Coronavirus Sequencing Consortium

The Irish Coronavirus Sequencing Consortium is funded by Science Foundation Ireland and led by Professor Paul Cotter from Teagasc Moorepark. The aim of the project is to sequence or "read" the genetic information of SARS-CoV-2, the virus that causes COVID-19. This will allow us to track the spread of the virus and any changes in its genetic sequence which may affect the disease or treatment.

<https://www.teagasc.ie/food/research-and-innovation/research-areas/food-bioscience/irish-coronavirus-sequencing-consortium/>

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NUI Galway: Kate Reddington and Grainne McAndrew and Simone Coughlan

TCD: Jose Sanchez-Morgado

UCC: John MacSharry

UCD (AIID – All Ireland Infectious Disease Cohort): Paddy Mallon, Alejandro Abner Garcia Leon

UCD (NVRL – National Virus Reference Laboratory): Cillian DeGascun, Michael Carr, Gabo Gonzalez

University Hospital Limerick: Patrick Stapleton and Carolyn Meaney

Teagasc Moorepark (including **APC Microbiome Ireland** and **VistaMilk**): Paul Cotter, Fiona Crispie, John Kenny, Sheila Morgan, Calum Walsh, Amy Fitzpatrick, Elaine Lawton

Teagasc Grange: Matt McCabe

Teagasc Oakpark: Ewen Mullins, Michele Della Bartolla

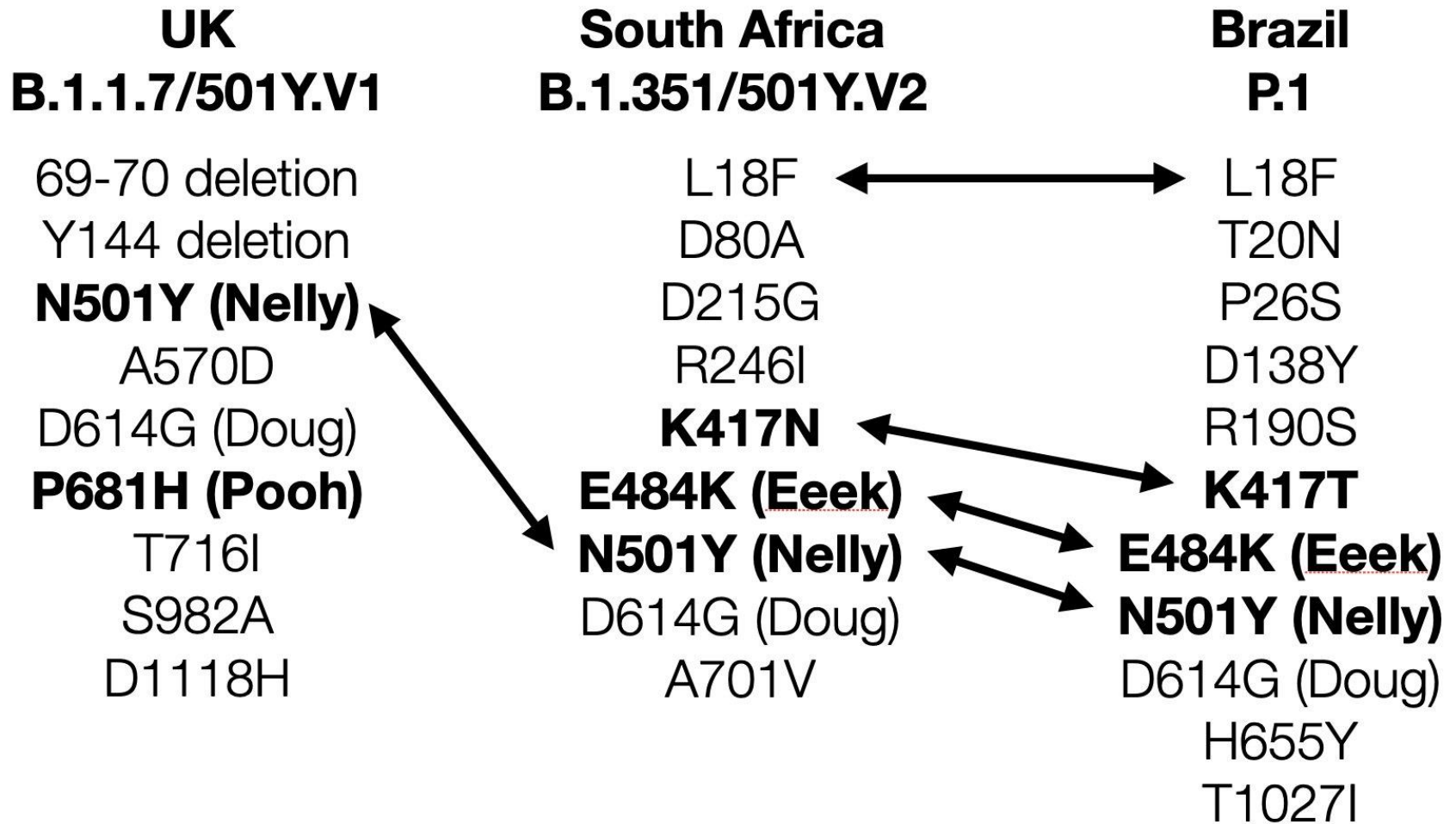
Genuity (GMI): Tom Dwyer, Tim Chambers

Helixworks: Conor Crosbie, Dixita Limbachiya, Sachin Chalapati, Nimesh Pinnamaneni

+ reduced costs reagents from **Oxford Nanopore Technologies**, **Labplan** and **Brennan's**.

(and many, many others who contributed to administrative support agreements, ethical approval, data protection agreements etc. etc.)

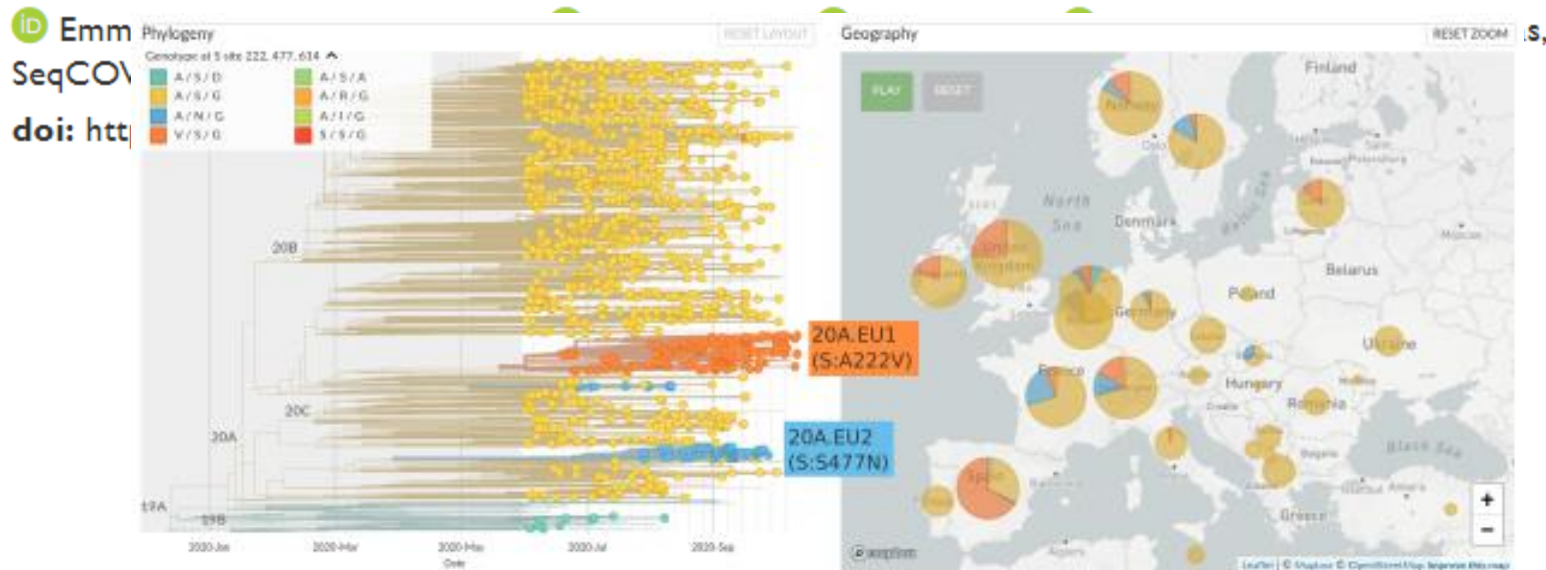
Variants of Concern



@K_G_Andersen

International Transmission

Emergence and spread of a SARS-CoV-2 variant through Europe in the summer of 2020



- Detected a variant and were able to track the spread of the variant from Spain to other European countries, including Ireland multiple times
- Much of the diversity of this cluster in Spain is observed across Europe.

Impact on Vaccination?



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Spain's strategy for rolling out the smallpox vaccine ran into some very 19th-century problems.

SAM KEAN JANUARY 12, 2021



Edward Jenner performing his first smallpox vaccination on a child in 1796. (SCIENCE HISTORY IMAGES / ALAMY)