

Predicting the spread of SARS-CoV-19?

How a phylogenetic network can give insight on a viruses spread.

Goal: With this study it is shown how important a phylogenetic network can be to help trace a virus, effectively oppose it and ultimately eradicate it completely.

A phylogenetic network is a graph to visualize the evolutionary relationships between nucleotide sequences, gene chromosomes, genomes, or species. They use nodes such as shown on the right figure.

- **Node A** is the root cluster obtained with the bat coronavirus isolate BatCoVraTG13. (*The A and C types are found in significant proportions outside East Asia, that is, in Europeans and Americans.*)
- **B type** is the most common type in East Asia, and its ancestral genome appears not to have spread outside East Asia without first mutating into derived B types.
- **C type** differs from its parent type B by the mutation G26144T which changes a glycine to a valine. In the dataset, this is the major European type, (with representatives in France, Italy, Sweden, and England, and in California and Brazil)

This is a phylogenetic network of SARS-CoV-2 genomes sampled from across the world (see Fig. 2). These genomes are closely related and under evolutionary selection in their human hosts, sometimes with parallel evolution events, that is, the same virus mutation emerges in two different human hosts.

Exp. → To get from Genom A to genom X two possible known routs of mutations could have been taken as shown by the red and blue path (see Fig. 1)

Relevance of the paper: This network approach, allows to reconstruct the prehistoric population movements which colonized the planet. That phylogenetic networks can be successfully used to help trace undocumented COVID-19 infection sources, which can then be quarantined to prevent recurrent spread of the disease worldwide.

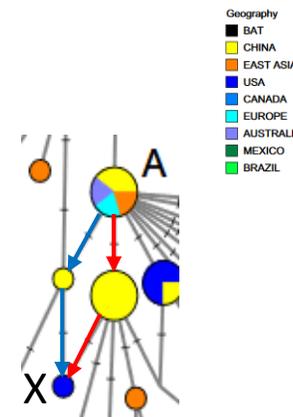
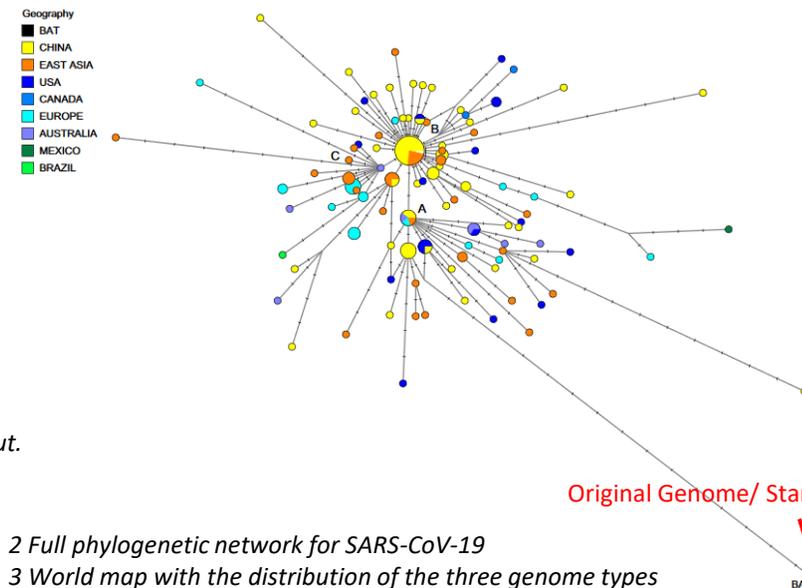


Fig. 1 Example rout.



↗ Fig. 2 Full phylogenetic network for SARS-CoV-19

↘ Fig. 3 World map with the distribution of the three genome types

