



covid-19 @ bcpl-certh

Activities on COVID-19 epidemiology, SARS-CoV-2 metabolism and viral genomics

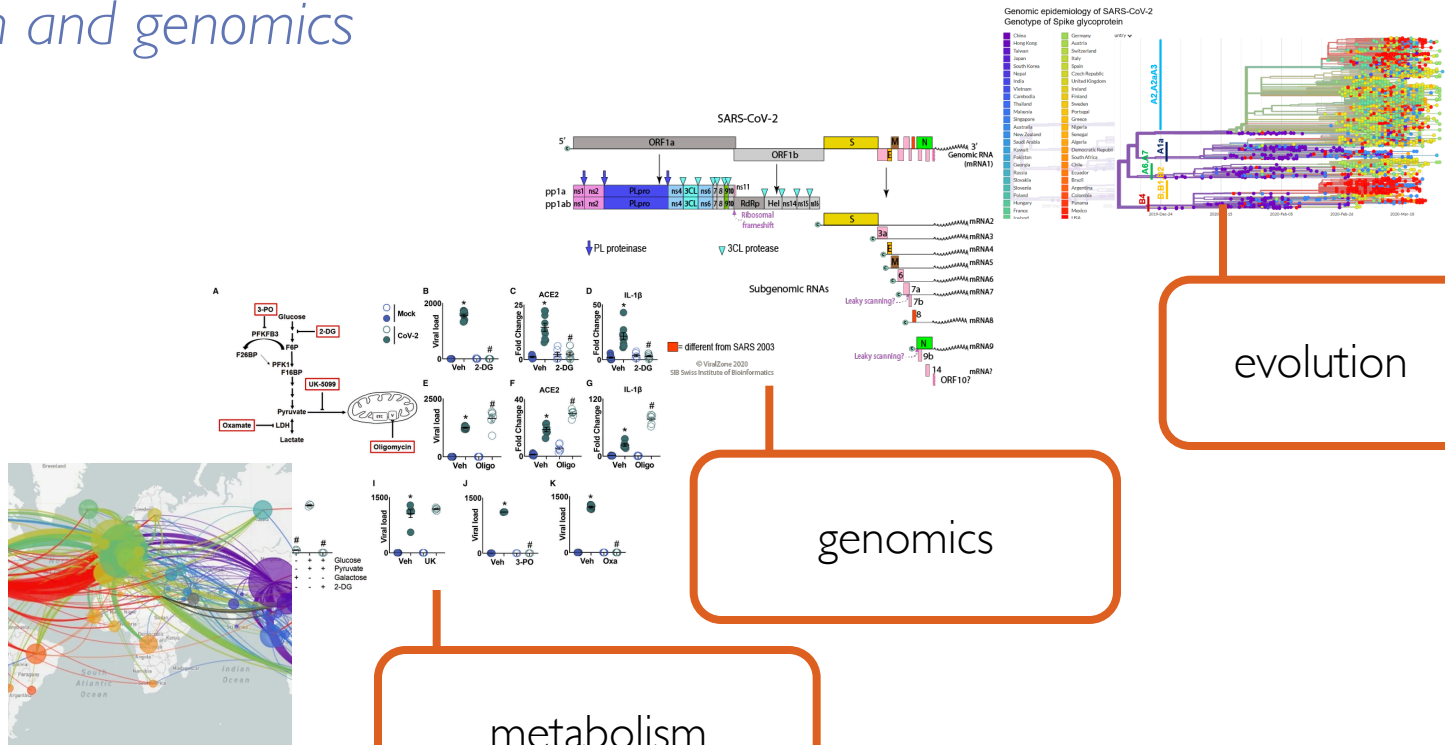
Anastasia Chasapi, Christos Karapiperis, Christos A. Ouzounis



www.elixir-europe.org

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COVID-19 epidemiology with big data analytics and SARS-CoV-2 metabolism and genomics



evolution

genomics

metabolism

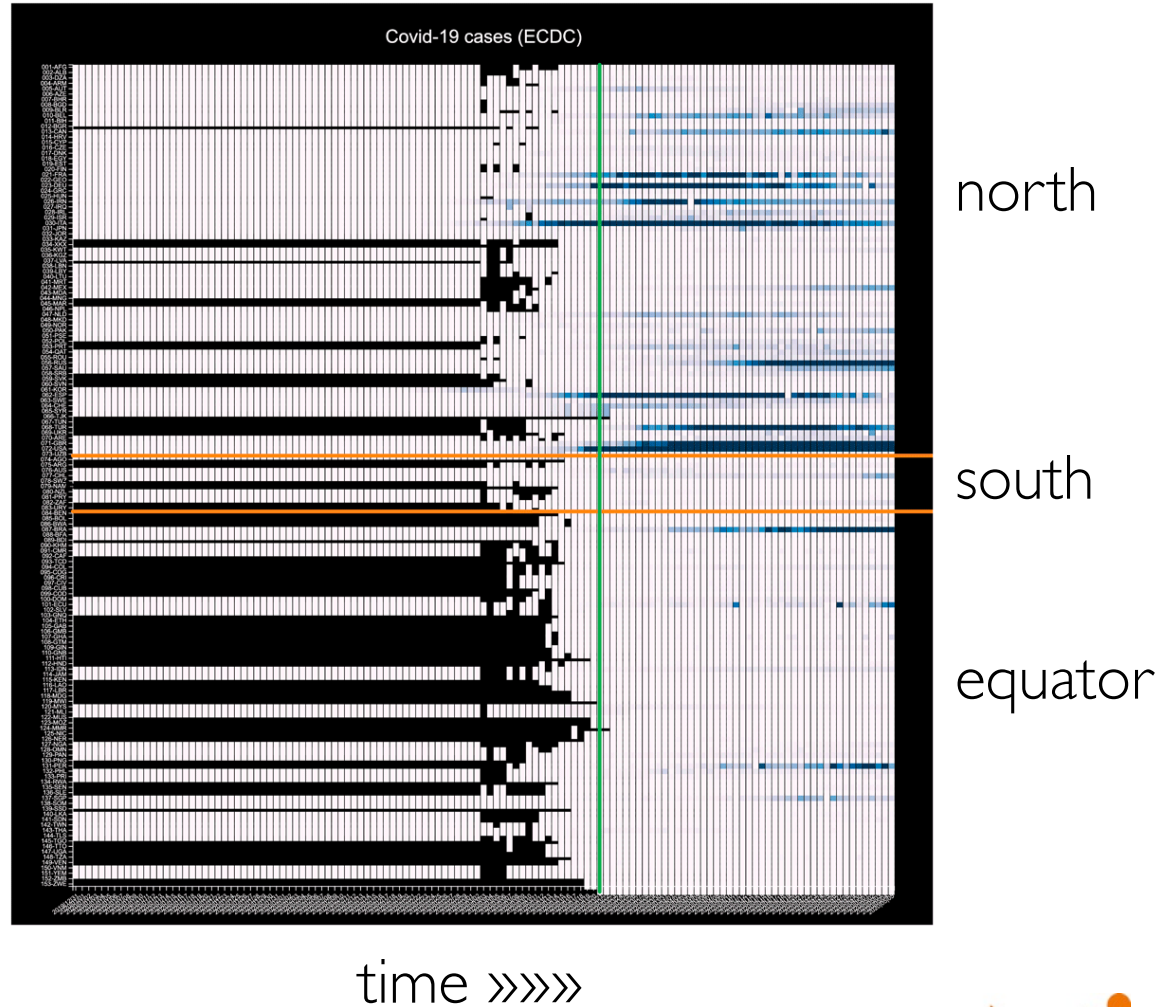
epidemiology

<https://osf.io/kgxuf/wiki/Links/>



Examining the seasonality of covid-19 with limited data

- much too much talk about 'summer'/heat-humidity-wind speed
- the most obvious, biologically meaningful factor for spread control in the open: UV
- day length = UV can play a key role
- example: North-South hemispheres



preprint: <https://osf.io/397yg/>

paper: <https://fl000research.com/articles/9-658>

Inspired by wildlife observations

- southwestern Indian Ocean, summertime, Réunion and Madagascar
- no coronavirus in 338 samples of seabird nests
- summer sun, sea breeze must keep bird populations in the wild healthy
- how wildlife responds to coronavirus infections with regard to seasons and climate change is unknown



1 October 2013

Absence of Coronaviruses, Paramyxoviruses, and Influenza A Viruses in Seabirds in the Southwestern Indian Ocean

Camille Lebarbenchon, Audrey Jaeger, Matthieu Bastien, Matthieu Le Corre, Koussay Dellagi, Hervé Pascalis

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J. of Wildlife Diseases, 49(4):1056-1059 (2013). <https://doi.org/10.7589/2012-09-227>

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Completely missed opportunity by epidemiologists

- in 50 years of seasonality research, epidemiologists missed completely the UV factor — WOW?
- only last year, first report on influenza for UV effects
- for covid-19, no direct seasonality factors in May
- for UV, we used as proxy altitude for country with highest UV levels: Peru

Open Access Article

Low Temperature and Low UV Indexes Correlated with Peaks of Influenza Virus Activity in Northern Europe during 2010–2018

by Aleksandr Ianevski¹, Eva Zusinaite², Nastassia Shtaida², Hannimari Kallo-Kokko³, Milla Valkonen⁴, Anu Kantale⁴, Kaidi Telling², Irja Lutsar⁵, Pille Lotjuka⁶, Natalja Metelitsa⁶, Valentyn Oksenyich¹, Uga Dumpis⁷, Astra Vitkauskiena⁸, Kestutis Stasaitis⁹, Christina Ohrmalm¹⁰, Kåre Bondeson¹⁰, Anders Bergqvist¹⁰, Rebecca J. Cox¹¹, Tanel Tenson², Andres Merits² and Denis E. Kainov^{1,2,*}

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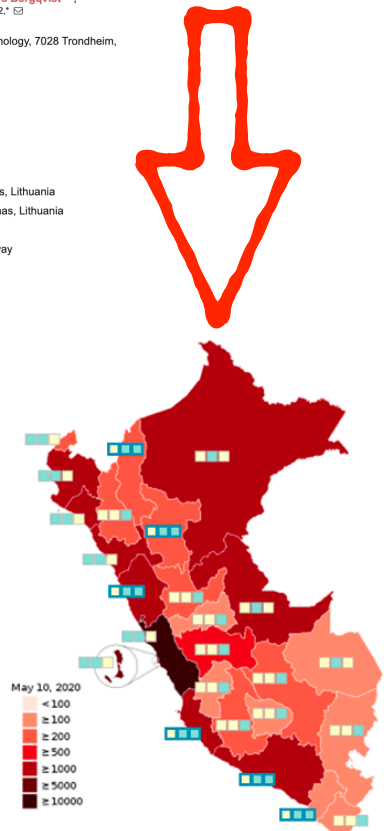
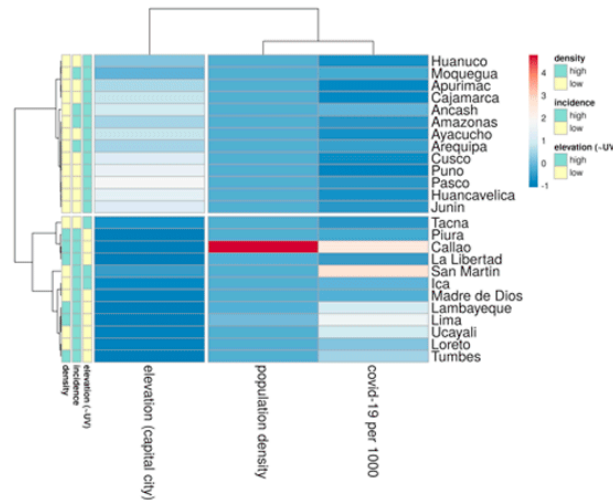
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Viruses 2019, 11(3), 207; <https://doi.org/10.3390/v11030207>



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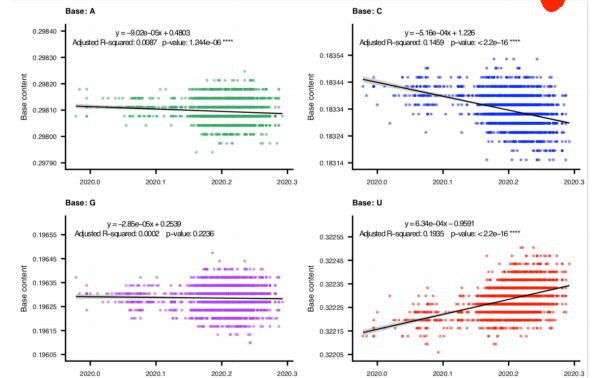
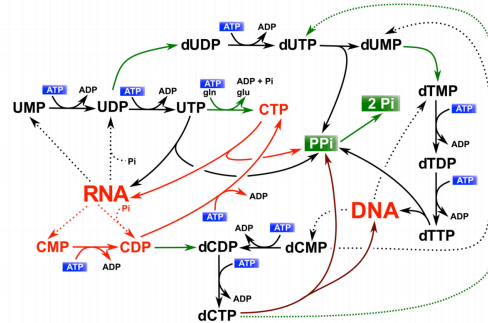
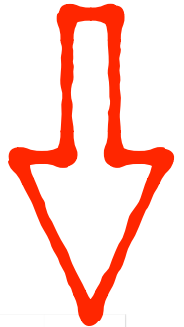
CTP as a limiting step in virus metabolism

- not understood that viruses need a huge metabolic load during replication, confusion
- base composition of coding regions from 2574 SARS-CoV-2 strains
- monitored time evolution of CTP reduction during the pandemic
- Cytidine content decreases during SARS2 real-time evolution

A path towards SARS-CoV-2 attenuation: metabolic pressure on CTP synthesis rules the virus evolution

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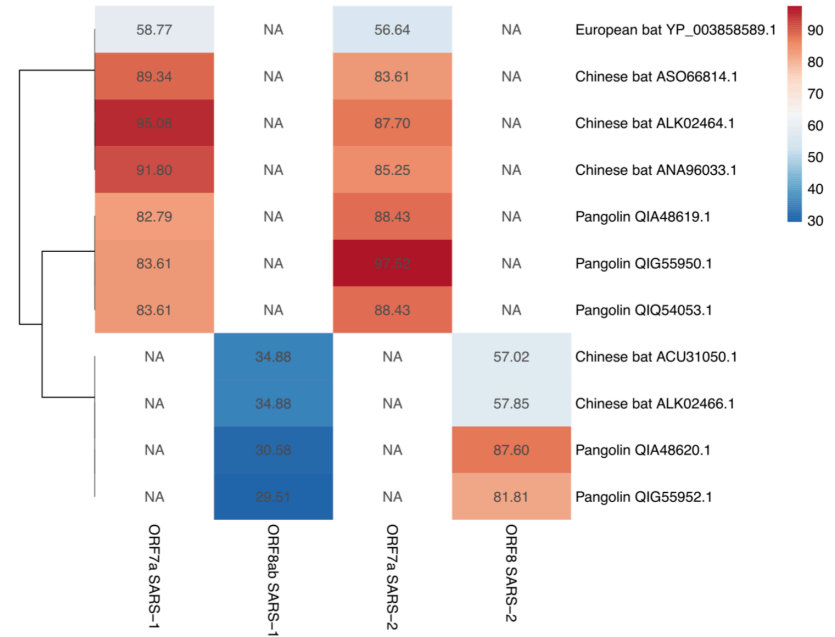
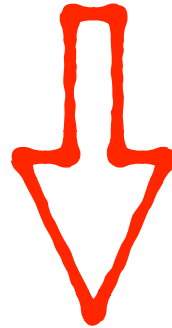


preprint: <https://www.biorxiv.org/content/10.1101/2020.06.20.162933v1.abstract>



Atypical divergence of SARS-CoV-2 Orf8 from Orf7a

- Orf8 one of the most puzzling, important and unknown genes of SARS-CoV-2
- huge variation, unknown but critical role; restricted only to bat/civet/pangolin SARS lineage (but not MERS)
- homologous to Orf7a and generated by the virus evolution, known origins !
- missed for years from SARS (in two pieces Orf8a/b)...



Lessons learned, relevant to Elixir

- Publishers responded slowly in the crisis
- Publication model collapsed during covid-19
- Preprints dominated the landscape (and still do)
- For critical situations, data such as UV, climate, metadata, very hard to obtain, not open etc. etc.
- Metabolism of viruses in the host not appreciated
- Pangenomes for SARS-CoV-2 not available, why?
- Epidemic disasters/pandemics never really in fashion