COVID-19 and Hearing Implants

Publications

Status Report

(Dec 12, 2020 – Feb 15, 2021)

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Publications

Following publications were identified for the period between Dec 12, 2020 and Feb 15, 2021, with interesting information on the following topics:

Mutations – variants

The most outstanding topic during this updating period is of the virus mutations and the new variants.

For better understanding, "mutations" are the errors happened during the viral RNA duplication and the viruses with these mutations are called "variants". Variants could differ by a single or many mutations. While many of the mutations won't change the behavior of the virus, a variant is only referred to as a "strain" when it shows distinct physical properties.

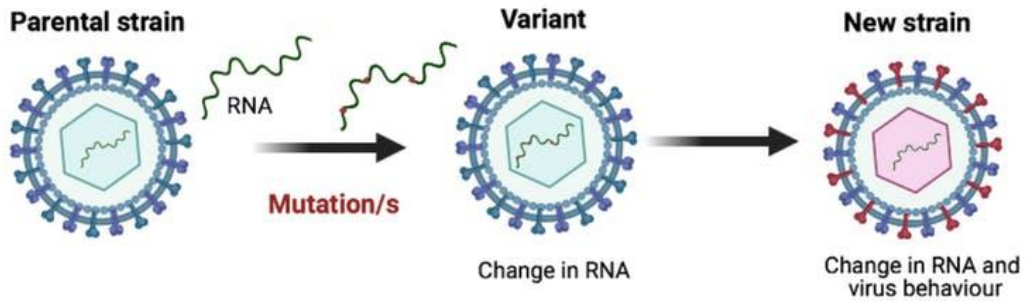

Figure 1: Viruses with mutations become variants. If the variant displays different physical properties to the original virus, we call it a new strain. Lara Herrero

Three of the most common SARS-CoV-2 variants (which are also strains) spreading at the moment are the UK variant (B.1.1.7), the South African variant (B.1.351) and the Brazilian variant (P.1). A summary on the main features and behavior of these variants are provided in **Table 1** below.

Table 1: Summary on current variants of concern

Official name	**B.1.1.7**	**B.1.351**	**P.1**
First identified in	UK	South Africa	Brazil
Earliest sample date	2020-09-20	2020-10-08	2020-12-04
Countries reported			
Other names used	N501Y.V1 20B/501Y.V1 VOC 202012/1	N501Y.V2 20H/501Y.V2 VOC 202012/2	N501Y.V2 20H/501Y.V2 VOC 202012/2
Nr. Of mutations	23	21	17
Key RBD, spike mutations beyond N501Y in all	69/70 del, P681H, Y144 del, A570D	E484K, K417N, orf1b deletion	E484K, K417N, orf1b deletion
Transmissibility	>50% increased	NOT established	NOT established
Lethality	Not resolved	unknown	unknown
Immune escape	Partial	Yes	Likely

Official name	B.1.1.7	B.1.351	P.1
Vaccine efficacy [1]	Novavax 86% (vs. 96% for previous variant) AstraZeneca 75% (vs. 84%) Pfizer and Moderna have only in vitro data	Janssen 57% (vs. 72% in US) Novavax 60% in HIV negative, 49% in HIV positive AstraZeneca: 10? (minimal)	Not established
Therapeutic monoclonal antibodies	both Eli Lilly's mAB and Regeneron's mAB work	Not neutralized with Eli Lilly's mAB and REGN10933, REGN10987 still works	Possibly not work anymore. Lack of data.

These variants are believed to be **more transmissible**, which consequently associated with an increased risk of hospitalization and death compared to infection with previously circulating viruses. **Figure 2** depicts a simplified scenario showing the number of new deaths every six days from three different viral strains, assuming each strain started from 10.000 infections. It shows how a more infectious virus may lead to more deaths.

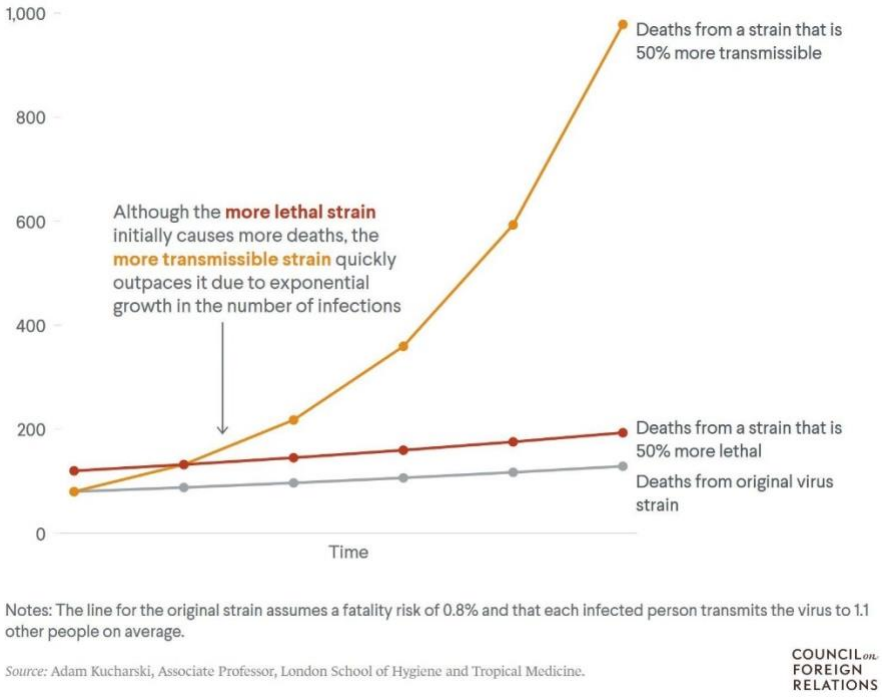

Figure 2: A more infectious virus could lead to many more deaths. Simplified, hypothetical scenario showing the number of new deaths every six days from three different virus strains, assuming each strain started from 10.000 infections. Source: Adam Kucharski

[1] Pfizer and Moderna haven't done clinical trials in S. Africa like the other vaccines, so there is no comparable data for them. They have both shown moderately reduced neutralizing antibody responses against the strain in test tubes. Overall, there's likely preserved efficacy vs death & hospitalizations, but some reduced suppression of mild/moderate illness. The ongoing studies at Pfizer and Moderna for asymptomatic transmission (daily NP swabs) need to be extended to these variants.

Data from UK, Denmark, Belgium and Switzerland show that B.1.17 replaces previously dominating strains in a predictable manner, progressing from 20% to 80% in 4 weeks (**Figure 3**). It is predicted that after another few weeks of enhanced transmission, new epidemic waves might build as early as **mid-March**, While 'hard' lockdowns are apt at controlling the new variants (see below: UK, Ireland, South Africa), 'soft' lockdowns may not be sufficient.

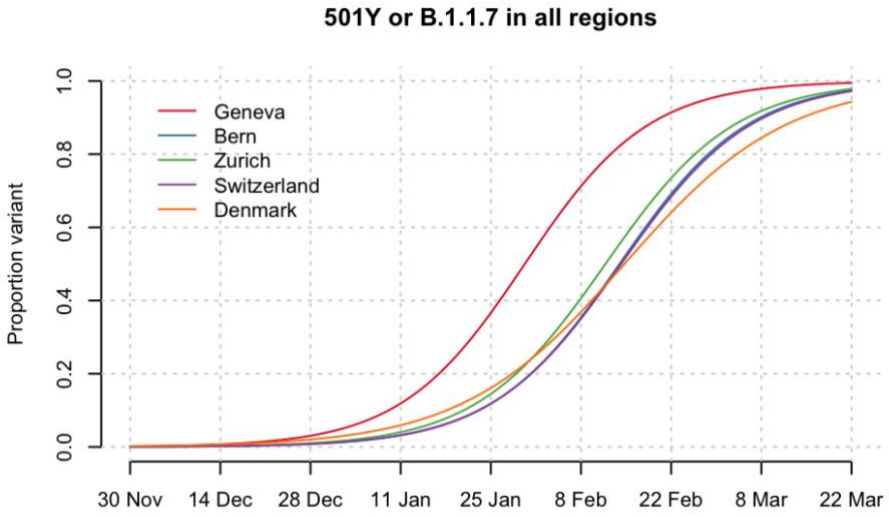

Figure 3: The proportion of B.1.1.7 among confirmed SARS-CoV-2 case increases at a similar pace in different regions of Switzerland. Geneva appears to be around two weeks ahead of the rest of Switzerland. Source and copyright: Christian Althaus.

Some other variants are also on focus, but there are not much data available yet to disclose the impact, such as:

- **Fin-796H:** a new variant discovered in Finland, which may not show up on normal PCR test. The transmissibility is unclear.
- **CAL.20C**: a variant identified in association with a recent surge in Southern California, which is reported spreading rapidly that accounted for about 36% of samples collected at CSMS between Nov. 22 and Dec 28 (Wenjuan Zhang Feb 11, JAMA). The variation includes 3 mutations in the spike protein, which is a target of vaccines and monoclonal antibodies, raising concerns about the potential implications for disease severity and infectivity. Functional effects remain uncertain.
- **B.1.525**: a variant first detected in the UK and Nigeria in December and sports a handful mutations that could allow it to evade immunity-conferring neutralizing antibodies as the B.1.351 AND has similarities to the highly transmissible B.1.1.7.

Epidemic

- A study of PCR testing on deceased people in one hospital in Lusaka, Zambia showed that among the 364 deaths, 70 were detected corona virus (19.2%). Most of them (51/70) were dead in community without any tests before death. Among the 19 people who died in hospital, only 6 were tested before death. It is concluded that contrary to expectations, deaths with COVID-19 were common in Lusaka and were vastly under-reported due to lacking of testing capacity. (Lawtence Mwananyanda Feb 17, BMJ)

- A longitudinal, prospective cohort study examined how protective detectable antibodies are to prevent subsequent infections with SARS-CoV-2 on 3249 marine recruits. The study results suggested that although antibodies induced by infection to SARS-CoV-2 are largely protective, they do not guarantee effective immunity against subsequent infection, as evidenced through a longitudinal, prospective study of young Marine recruits. Previously infected study participants identified by seropositivity are susceptible to repeat infection, with nearly one-fifth the incidence rate of those without evidence of previous infection. Among the seropositive group, **those who became infected again had lower antibody titers** than those that were uninfected, and most lacked detectable baseline neutralizing antibodies. Findings suggest that COVID-19 **vaccination may be necessary for control of the pandemic in previously infected young adults**. (Andrew G, Jan 29, BMJ)
- A systematic review on the comparison of saliva and nasopharyngeal swab nuclei acid amplification testing (NAAT) showed that **saliva NAAT had a similar sensitivity and specificity to that of nasopharyngeal NAAT**. (Guillaume Butler-Laporte Jan 15, JAMA Network)
- Early results from students testing at the University of Birmingham and universities in Scotland showed that tests with **Innova SARS-CoV-2 antigen rapid qualitative test** had **a low sensitivity** of just 3% and that 58% of positive test results were false. (Armstrong Stephen, Dec 23, BMJ)
- After decision analytical modelling assessing multiple scenarios, it is discovered that the **transmission from asymptomatic individuals was estimated to account for more than half of all transmission**. The findings of this study suggest that the identification and isolation of persons with symptomatic COVID-19 alone will not control the ongoing spread of SARS-CoV-2. (Michael A. J. Jan 7, JAMA Network)
- An analysis of COVID-19 data from 41 countries has identified 3 measures that each substantially cut viral transmission: school and university closures, restricting gatherings to no more than 10 people and shutting businesses. But adding stay-at-home orders to those actions brought only marginal benefit. (Jan M. Brauner Feb 19, Science)

Prevention

- Nasal spray of lipopeptide fusion inhibitors (in animal model): Daily intranasal administration to ferrets completely prevented SARS-CoV-2 direct-contact transmission during 24-hour co-housing with infected animals, under stringent conditions that resulted in infection of 100% of untreated animals (Rory D. DeVries, Feb 17, AAAS).

COVID-19 and inner ear function

- An Israeli study investigated auditory performance in recovered COVID-19 patients with OAE and ABR testing on 8 recovered asymptomatic COVID-19 patients (with normal hearing) and a control group. No significant difference was discovered between recovered asymptomatic SARS-COV-2 patients and controls in any of transitory evoked otoacoustic emission (TEOAE), distortion product otoacoustic emissions (DPOAE), or ABR responses. (Dror Amiel A. Otology & Neurotology) [2]
- COVID-19 pandemic is making tinnitus worse: An online survey (mixed-methods exploratory cross-sectional study) was carried out among 3,103 tinnitus sufferers from 48 different countries, with most from the UK and America and found Covid-19 symptoms exacerbated tinnitus in 40 % of those surveyed. Meanwhile, no change was reported in 54 % of

[2] The sample size is not big. A long-term evaluation on a larger cohort is needed.

respondents while 4% found their condition had actually improved. (Eldre W. Beukes Nov 5, Front Public Health)

Hearing Implant

- Impact of the pandemic to CI users was investigated using Ecological Momentary Assessment (EMA) by Camille C Dunn (Dec 22, Ear Hear). A total of 48 adults with at least 12 months of cochlear implant (CI) experience reported their listening contexts and experiences pre-COVID and during-COVID using EMA. CI participants in this study reported that they were spending more time at home in a quieter environments during-COVID. Contrary to our hypothesis, CI recipients overall felt less socially isolated and reported less anxiety resulting from their hearing difficulties during-COVID in comparison to pre-COVID.