

Will new variants compromise vaccines?

If the goal of the UK government COVID response was to “protect the NHS”, it has now failed in many parts of the country. Ambulances backing up outside A&E departments, intensive care units over capacity, doctors and nurses beyond despair with high sickness levels. And an ever-increasing burden of infections, hospitalisations and deaths.

With the complicated tier system in England not able to constrain virus transmission, thus allowing the new variant to rapidly spread, Independent SAGE as well as other scientific experts are calling for an [immediate national lockdown](#), and for schools to only re-open when providing a safe virus free environment.

The much lauded “light at the end of the tunnel” is vaccine rollout- indeed, a tremendous feat of scientific effort. However, new virus variants are evolving reflecting a type of arms race between the virus and humanity. What risk do they pose to the success of vaccines?

Viruses are in essence coated pieces of genome (DNA or RNA) which must transmit to survive. They are the optimal evolutionary machine, with the sole aim to survive through transmission from one person to another. Disease and death are an unfortunate side effect of this transmission. As they replicate, frequent errors - mutations - occur in the re-writing of genetic material. Most mutations render those new viruses well and truly dead, however some provide benefit to the virus (as is seen with the new COVID-19 variant which has higher transmissibility) and will grow and survive. Mutations can only occur as long as the virus is able to continually replicate and transmit. No replication means no mutations. So, the current high levels of COVID-19 in the UK provide an ideal circumstance for new variants to emerge.

Should we be worried that SARS CoV-2 could mutate and escape control of the vaccines? What is the evidence so far?

The first concern is that SARS CoV-2 has shown to be more prone to mutation and change than perhaps first assumed back in January 2020. We are fortunate in the UK to host the [COVID-19 Genomics UK Consortium](#) which brings together a large group of experts able to map the genetic changes as they happen, and which makes a major contribution to the global database of SARS CoV-2 variants. Of concern, some of these mutations are occurring in some key targets for vaccines - the part of the virus responsible for binding to human cells, and which is attacked by the vaccine-generated antibodies.

Secondly, we know that these viral variants can reduce the efficacy of some trial immune therapies- such as [monoclonal antibodies](#), or [convalescent plasma](#). Whilst not widely used, these therapies will be useful in some high-risk patients, such as those who happen to be immunocompromised.

Thirdly, these mutant/variant viruses can spread. We are currently witnessing the rapid spread of variant VOC 20212/01 (otherwise known as lineage B.1.1.7), which is estimated to have a [40%-80% transmission advantage](#) over other variants and is present in many other countries. Similar variants are now also emerging in South Africa and elsewhere.

So, what of the impact on vaccines? There is no evidence to date that these variants will be resistant to the current vaccines- indeed, [vaccines work by generating a large array of antibodies and T cells](#) which will work even if a small number of these antibodies are compromised by specific viral mutations. Nevertheless, further evolution of the current variants, which already have changes in the key antibody binding areas of the virus, may start to impact on future vaccine effectiveness. Delay in second dosing may contribute to this risk. We are entering a risky period, with the very high levels of transmission at precisely the same time as vaccine rollout - leading to evolutionary pressure on the large amount of virus in the population to escape vaccine immunity.

This is one additional reason- if any more are needed- to instigate **a full stricter national lockdown as soon as possible**, with a **far better functioning of other public health measures, such as a Find, Test, Trace Isolate and Support system** in place to stop further transmission of the current and new variants. We need to maximise the effectiveness of the vaccines coming down the track.