Cell-cell fusion and tissue damage – a potential mechanism for side-effects from the Covid-19 vaccines?

Recent studies demonstrate that the spike protein in SARS-CoV-2 can cause the fusion of cells via three different methods – one even when no viral replication is taking place. The Covid-19 vaccines, currently in use in the UK, the EU and the US, trigger the production of full-length viral spike proteins in our cells. Some scientists are now questioning whether these vaccine-generated spike proteins could have this same property. If so, this could have serious potential health ramifications.

Fusogenicity of SARS-CoV-2 Spike protein evidenced in a highly reputable study

The Paul Ehrlich Institute (PEI) is the German institute for vaccines and biomedicines. It is a federal agency and subordinate to the Federal Ministry of Health.[i] A March 2021 PEI press-release "Measure What Fuses – Tissue Damage through Cell Fusion in COVID-19 and the Role of the Spike Protein" states:

"The Coronavirus SARS-CoV-2 enters human cells by membrane fusion after contact of its spike protein with the ACE2 receptor. New studies provide proof for a second role of the protein in COVID-19: Fusion of body cells. A research team of the Paul-Ehrlich-Institute has developed promising assays of how to measure these membrane functions. Smallest amounts of spike protein present in cell culture suffice to allow infected and non-infected cells to fuse and die. Virus particles with spike protein on their surface can cause cells to fuse with their neighbours even by contact alone."[ii]

That press release announced the publication on 19 March 2021 of an article co-authored by the President of the Paul Ehrlich Institute, Professor Klaus Cichutek[iii], that was submitted as a pre-proof article to iScience on 21 October 2020, entitled "Quantitative assays reveal cell fusion at minimal levels of SARS-CoV-2 spike protein and fusion from without".[iv]

Had the Paul Ehrlich Institute itself – responsible for monitoring every aspect of vaccines and their rollout in Germany[v] – uncovered a dangerous potential side-effect of COVID-19 vaccination as early as October 2020?

Produces multi-nucleate giant cells: syncytia

Experienced and well-respected scientists including Dr Mike Yeadon and Professor Wolfgang Wodarg are emphatically warning that it is now known that the S protein of the SARS-CoV-2 virus is not just a passive anchor, but is biologically active – making cells stick together to form multinucleated giant cells. The iScience article cited above, whose authors are all affiliated to the institute responsible for rolling out Covid-19 vaccines in Germany, evidenced that the S spike protein of the SARS-CoV-2 virus is equipped with "remarkable fusogenic activity"vi along more axes than most viruses investigated to date.

These multinucleated giant cells are called "syncytia". Syncytia formation has been well documented in relation to other viruses and enables the virus to spread between cells. They have been detected in tissues such as the lung (from the measles virus), skin (from the herpes virus), or lymphoid tissues (from the human immunodeficiency virus).[vii]

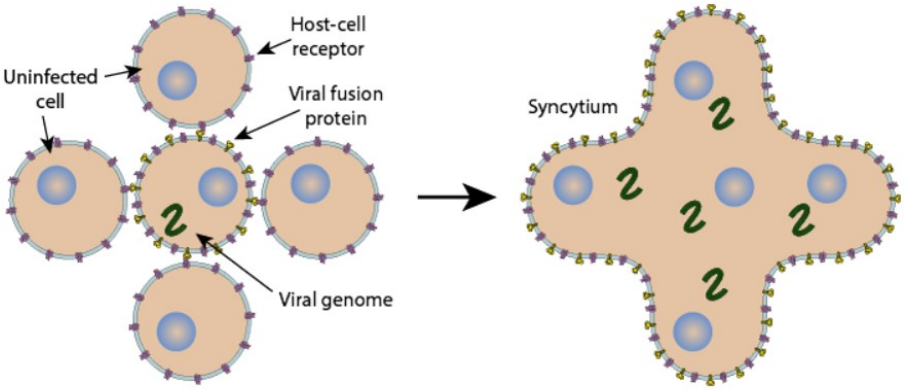


Fig. 1 Syncytium formation, https://viralzone.expasy.org/5957?outline=all_by_species

Fusion even without viral replication

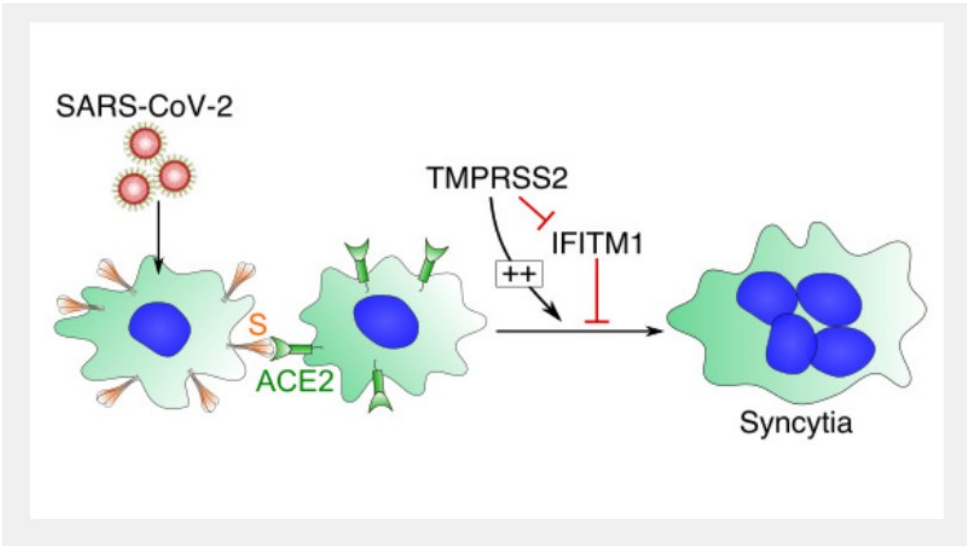
Cichutek et al, in the aforementioned iScience article, found that the SARS-CoV-2 S protein is capable of three distinct membrane fusion processes:

i) S-mediated cell fusion,

ii) "fusion-from-within", and

iii) "fusion-from-without".

The first, S-mediated cell fusion, is particle-cell fusion, the process that mediates fusion between the viral and cellular membranes during entry of the viral particles into the cell. The second, fusion-from-within (FFWI), is the ability of the S protein to mediate "fusion of infected cells with uninfected cells."viii This enables the virus to spread and is well-known for example from the human simplex virus (HSV1)ix. The third membrane fusion process, fusion-from-without (FFWO), is the process by which particles of enveloped viruses can instigate the fusion of target cells even in the absence of viral replication.



Source: *Buchrieser J et al. Syncytia formation by SARS -CoV-2-infected cells. EMBO J. 2020 Dec 1;39(23):e106267*

The iScience article reports that in the case of SARS-CoV-2: "the mere presence of the isolated spike proteins, without the viral body, can lead to such cell fusions on a large scale … The data reveal a strong membrane fusion activity of the S protein and demonstrate syncytia formation even at undetectable levels of S protein and FFWO."

Thromboses and tissue destruction already seen in Covid patients

It is entirely plausible that blockages in veins and capillaries could be caused by the formation of these multi-nucleate enlarged cells. Ultimately, apoptosis is the result: "*Smallest amounts of spike protein present in cell culture suffice to allow infected and non-infected cells to fuse and die*."[x] However, the formation of micro-thromboses and tissue destruction are inevitable during this process: sequelae that have been observed in some Covid-19 patients.[xi] Syncytia can even cross the blood brain barrier: in experiments with mice, Ferren et al found hyperfusogenic proteins in encephalitis caused by the measles virus, often manifesting years later.[xii]

Is the spike protein in the Covid vaccines also capable of this?

The first of the three fusion processes outlined above is entirely expected when the S spike protein generated by a Covid-19 vaccine is formed, as these spike proteins fuse with the ACE2 receptors on any cells encountered that express them. But is the S spike protein generated by the Covid-19 vaccines capable of syncytium formation even in the absence of viral replication, i.e., this "fusion-from-without" that is a property of the wild SARS-CoV-2 virus? If so, these multi-nucleate giant cells could have the potential to form micro-emboli wherever they were formed. The resulting tissue damage would depend on their size, their numbers, and where they occur.

Biodistribution likely to be a key factor, but information lacking

Multiple spike proteins are expected to be generated in a vaccinee's cells that take up the mRNA or DNA, though there has been no information on the quantity of spike protein generated or the location of their occurrence. Both may vary, depending on whether the vaccine material enters the bloodstream, in which case the vaccine particles will be carried to distant locations. As explained by the virologist Professor Sucharit Bhakdi and others, in a recent open letter to the European Medicines Agency, it is likely that the vaccines will be taken up by endothelial cells, probably at sites of slow blood flow, i.e. in small vessels and capillaries.[xiii] An article about the lipid nanoparticle (LNP) encapsulation being used for delivery of mRNA vaccines in general, published by authors affiliated with a Moderna venture or Moderna Therapeutics, gave some indication of possible expected biodistribution of LNP-clad mRNA vaccines.[xiv] After intramuscular administration, this study found LNPs in 17 different compartments of the mice beyond the injection site. Vaccine LNPs were detected in the brain, heart, testes, and even the bone marrow, within varying periods of time

It could be argued that if the S protein being produced were truncated, the potential impact would not be so great, but the spike protein being induced by the Pfizer, AstraZeneca and Moderna vaccines is full-length in every case.[xv] It has been shown that even shortened particles may have the same effect, in this paper which states "*Potentially, this [FFWO] may also be caused by defective particles*".[xvi] The article goes on to say that "*in vivo, where in organs such as the lung, kidney, or liver, epithelial cells are tightly packed with very limited extracellular space, fewer particles will be necessary to trigger fusion".*

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We have not been able to identify any published trial data that has specifically investigated and ruled out the possibility of damaging effects resulting from the vaccine-induced S spike proteins that we have outlined above. We argue that the precautionary principle dictates that this possibility of multi-nucleate giant cell formation, and the resultant potential for collateral damage, MUST be urgently and thoroughly investigated and ruled out before continuing with the mass rollout of the Covid-19 vaccines.

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[i] https://www.pei.de/EN/institute/official-duties/duties-node.html;jsessionid=BD719108D014F832279EB3F326158A82.intranet242

[ii] https://www.pei.de/EN/newsroom/press-releases/year/2021/03-tissue-damage-through-cell-fusion-covid-19-role-spike-protein.html

[iii] https://www.who.int/biologicals/expert_committee/CICHUTEK_Klaus_BIO.pdf

[iv] https://www.sciencedirect.com/science/article/pii/S2589004221001383

[v] https://www.bundesgesundheitsministerium.de/english-version/ministry/authorities-within-the-remit/paul-ehrlich-institut-pei.html

[vi] https://www.sciencedirect.com/science/article/pii/S2589004221001383

[vii] https://pubmed.ncbi.nlm.nih.gov/31684034/

[viii] https://www.embopress.org/doi/full/10.15252/embj.2020106267

[ix] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5869023/

[x] https://www.sciencedirect.com/science/article/pii/S2589004221001383

[xi] https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.120.317447

[xii] https://pubmed.ncbi.nlm.nih.gov/31684034/

[xiii] https://doctors4covidethics.medium.com/urgent-open-letter-from-doctors-and-scientists-to-the-european-medicines-agency-regarding-covid-19-f6e17c311595

[xiv] https://pubmed.ncbi.nlm.nih.gov/28457665/

[xv] https://www.news-medical.net/news/20210222/An-overview-of-spike-protein-antigen-COVID-19-vaccine-candidates.aspx

[xvi] https://www.sciencedirect.com/science/article/pii/S2589004221001383