

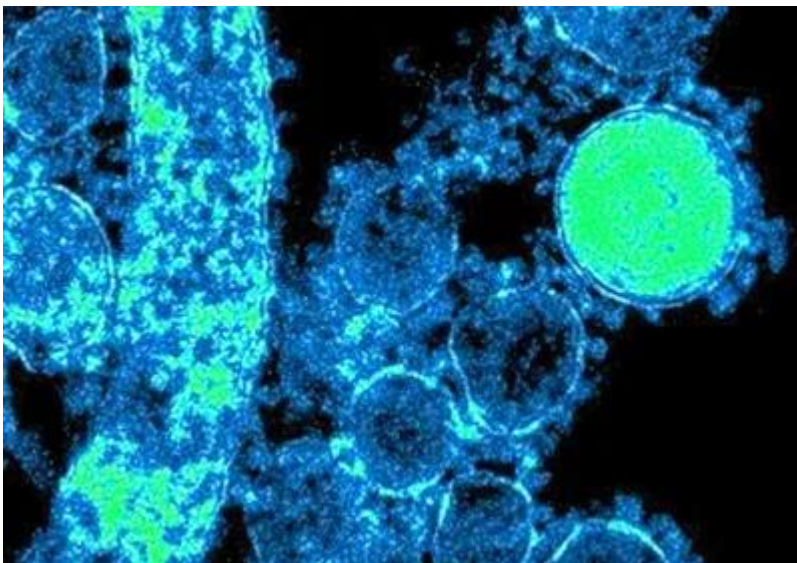
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Mass spectrometry analysis demonstrated that approximately 50% of those vaccinated against COVID-19 had specific fragments of recombinant S protein in their blood samples 2-6 months after vaccination | 1

BNT162b2 (Pfizer- BioNTech) and mRNA 1273 (Moderna) vaccines were the first messenger RNA (mRNA)-based vaccines ever approved. In both vaccines, an mRNA sequence determines the structure and assembly of the immunogen, the SARS-CoV-2 spike (S) glycoprotein. In this study, the authors from Italy and the United Kingdom used mass spectrometry analysis to investigate the presence of recombinant S protein, encoded by the mRNA vaccine, in blood samples of participants vaccinated with mRNA COVID-19 vaccines.

The researchers emphasized that synthetic and natural SARS-CoV-2 S proteins can be distinguished because they produce different tryptic digestion products. When digested by an enzyme, trypsin, the wild-type SAR-CoV-2 protein produces two smaller fragments, namely LDK + VEAQVQIDR. The recombinant SARS-CoV-2 S protein encoded by the mRNA vaccine produces an LDPPEAEVQIDR fragment (PP-spike marker).

The S protein appears to be a major pathogenic factor that contributes to the unique pathogenesis of SARS-CoV-2. The S protein plays three critical roles in facilitating host cell entry: it must bind to the host cell angiotensin-converting enzyme 2 receptor (ACE2), be proteolytically processed, and promote membrane fusion. Because of these reasons, it is one of the most important targets for vaccine development and therapeutic approaches against COVID-19. On the other hand, numerous studies have shown that the S protein by itself, without the rest of the viral components, is sufficient to promote various pathological effects and cause damage to different cells and organs.





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About the study

The study included 60 individuals: 20 vaccinated against COVID-19 who received the full cycle of the mRNA vaccine and 40 unvaccinated controls (20 tested negative for COVID-19 and 20 tested positive for COVID-19). Mass spectrometry was used to detect specific fragments of recombinant S protein encoded by the mRNA vaccine (in this study called PP-spike) in biological samples.

The results showed that approximately 50% of individuals who received mRNA-based COVID-19 vaccines had specific fragments of recombinant S protein in their blood samples. The minimum time when the PP-spike fragment was detected was 69 days after vaccination, and the maximum time was 187 days after vaccination.

The presence of circulating recombinant S protein was independent of the anti-SARS-CoV-2 IgG antibody titer.

All samples from 40 unvaccinated individuals (tested negative or positive for COVID-19) were negative for recombinant S protein.

Based on these results, the authors proposed several possible molecular mechanisms responsible for the persistence of the “PP spike fragment”- Figure 1.

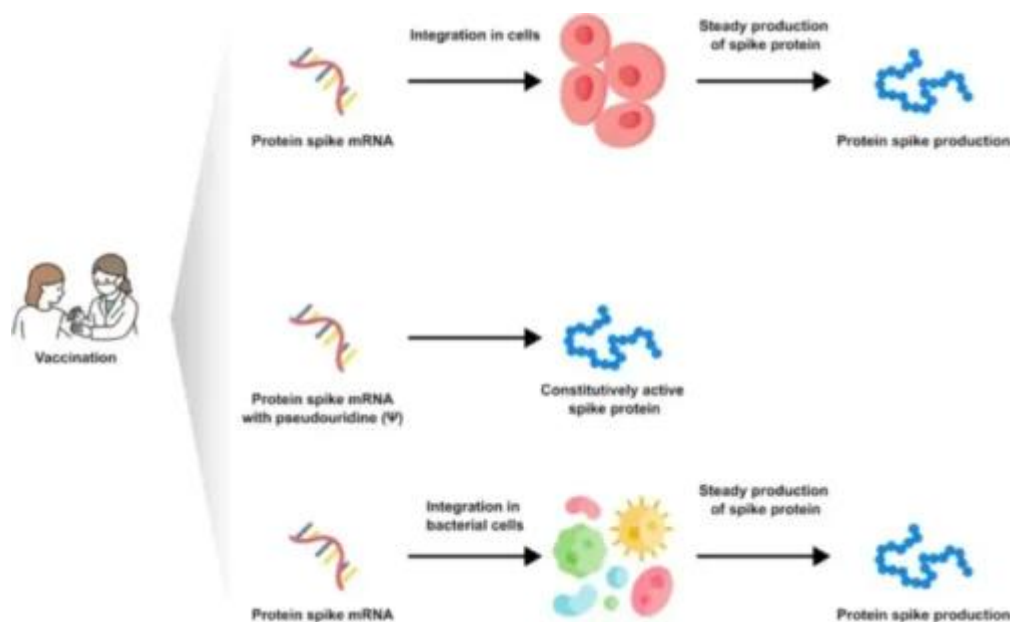


Figure 1 from the article by Brogna C et al. *Proteomics Clin. Appl.* 2023

Conclusion



Mass spectrometry analysis demonstrated that approximately 50% of those vaccinated against COVID-19 had specific fragments of recombinant S protein in their blood samples 2-6 months after vaccination | 3

This mass spectrometry analysis demonstrated that approximately 50% of those vaccinated against COVID-19 had specific fragments of recombinant S protein in their blood samples 2-6 months after vaccination. All blood samples from unvaccinated controls were negative for the presence of recombinant S protein.

The authors emphasized that this mass spectrometry analysis is the first proteomic detection of recombinant S protein in subjects who had been vaccinated. The results confirmed that this method allows the detection of circulating S protein encoded by an mRNA vaccine, and the evaluation of its half-life.

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Journal Reference

Brogna C, Cristoni S et al. Detection of recombinant Spike protein in the blood of individuals vaccinated against SARS-CoV-2: Possible molecular mechanisms. *Proteomics Clin. Appl.* 2023; 2300048. (Open Access) <https://doi.org/10.1002/prca.202300048>

