Spike-specific immune response induced by BNT162b2 mRNA vaccine in former COVID-19 patients and high responsive subjects

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Abstract

Background: The worldwide escalation of Coronavirus Disease 2019 (COVID-19) has urgently required the development of safe and effective vaccines against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is the causative agent of disease. The BNT162b2 (Pfizer–BioNTech) RNA-based vaccine confers 95% protection against COVID-19 by encoding a mutated isoform of SARS-CoV-2 full-length spike (S) protein. Objective: Here, we report the antigen-specific immune profile against SARS-CoV-2 S protein after vaccination with a single dose of BNT162b2 in order to define the immunological landscape required for an efficient response to the SARS-CoV-2 vaccine. Methods: We determined the levels of antibodies and antigen-specific B, T and NK-T cells against a recombinant GFP tagged SARS-CoV-2 S protein in subjects up to 20 days after injection of a single dose of BNT162b2 vaccine using a combined approach involving serological assays and flow cytometry analyses. Former COVID-19 patients have been also included in this study to evaluate the effect of vaccine after exposition to SARS-CoV-2. Results: The level of antigen-specific helper T-cells against SARS-CoV-2 S protein was reduced in subjects, low responsive or unresponsive to vaccination with respect to the highly responsive individuals, while the numbers of antigen-specific regulatory and cytotoxic T-cells were comparable. Of interest, in former COVID-19 patients, a single dose of BNT162b2 vaccine induced a significant increase of antibody production simultaneous with an antigen-specific B and NK-T cell response. Conclusion: Taken together, these results suggest that favorable immune profiles support the progression and an effective reaction to BNT162b2 vaccination.

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