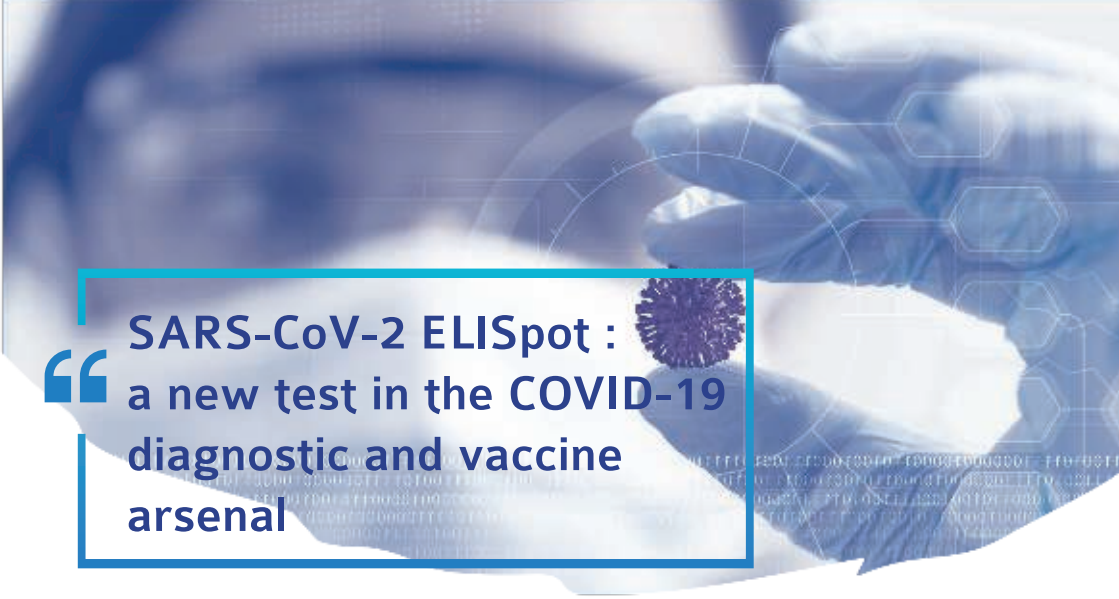
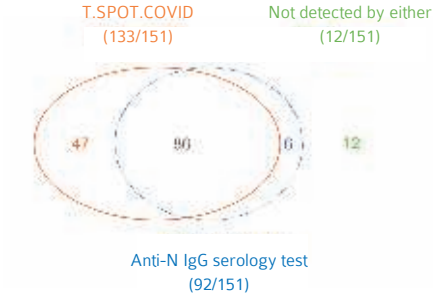


SARS-CoV-2 ELISpot : a new test in the COVID-19 diagnostic and vaccine arsenal

Following SARS-CoV-2 infection, an innate immune response occurs rapidly at the infection site and then an adaptive response occurs within 6-10 days. This response can be divided into 2 types: cellular immunity and humoral immunity with recruitment and multiplication of virus-specific cells.
The first response is mainly mediated by effector T cells (CD4+ helper and CD8+ cytotoxic T cells) while the second response is mainly mediated by antibody-producing B cells. The combined action of these specific cells allows the targeted elimination of infected cells in the body and the circulating virus (1).
However, the antibody response does not always occur (Figure 1). In addition, the antibody level may decrease significantly after infection. In this context, exploring T-cell-related immunity appears relevant. These T cells may be detected in the blood 2-4 days after the onset of the symptoms and persist for at least 6-9 months.

Figure 1. Sensitivity of the COVID ELISpot assay compared to serology testing to detect anti-SARS-CoV-2 nucleocapsid antibodies in infected patients



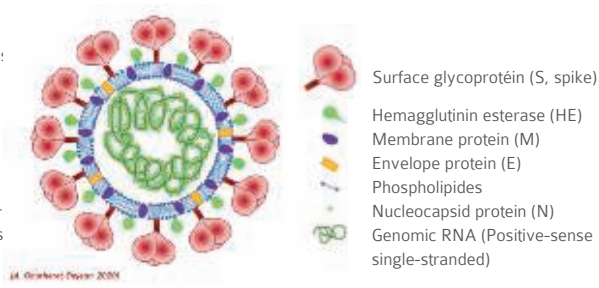
In which patients should this T-cell-mediated immune response be studied?

Serology testing is, to date, the main tool allowing exploring the anti-SARS-CoV-2 immune response. Its place in the diagnostic and vaccine arsenal has been redefined based on the Haute Autorité de Santé (French Health Authority) recommendations of June 17, 2021 (2).
Nevertheless, the study of the immune response mediated by CD4+ and CD8+ T cells is of interest:
In the retrospective diagnosis of acute SARS-CoV-2 infection not shown by RT-PCR in patients with negative or suspicious serology. This situation is mainly observed in patients who developed a pauci-symptomatic or asymptomatic form of infection (3). The sensitivity of the ELISpot assay in these seronegative infected patients is 50-80% (4,5).
In the differential diagnosis of SARS-CoV-2 infection in immunocompromised patients (6).
In the follow-up of vaccine efficacy (7), especially in immunocompromised patients.
In the study of the efficacy of the vaccines on SARS-CoV-2 variants (8).

What is an ELISpot assay?

The assay consists of measuring the specific cellular response against more than 250 peptides of the SARS-CoV-2 Spike (S) and Nucleocapsid (N) proteins by quantifying the number of interferon γ-producing cells. The lymphocytes of ill or vaccinated patients are isolated and then brought into contact with the virus antigens (9). After 20 hours of incubation, the production of interferon γ is measured.
A positive assay allows differentiating the immunity related to infection with the virus (testing positive for anti-SARS-CoV-2 S-protein and N-protein antibodies from the immunity related to vaccination (testing positive only for anti-SARS-CoV-2 S-protein antibodies).

Schematic representation of SARS-CoV-2 structure



References:

1.Sette A, Crotty S. Adaptive immunity to SARS-CoV-2 and COVID-19. Cell. Published online January 2021:S0092867421000076. doi:10.1016/j.cell.2021.01.007

2.https://www.has-sante.fr/jcms/p_3272802/fr/avis-n-2021-0042/ac/seap-du-17-juin-2021-du-college-de-la-has-relatif-aux-modifications-des-conditions-d-inscription-sur-la-lap-mentionnee-a-l-article-l-162-1-7-du-css-de-la-detection-des-anticorps-seriques-diriges-contre-le-coronavirus-sars-cov-2

3. Sekine T, Perez-Potti A, Rivera-Ballesteros O et al. Robust T cell immunity in convalescent individuals with asymptomatic or mild COVID-19. Cell. 2020; 183(1): 158-168

4. Schwarzkopf S, Krawczyk A, Knop D et al. Cellular Immunity in COVID-19 Convalescents with PCR-Confirmed Infection but with Undetectable SARS-CoV-2-Specific IgG. Emerg Infect Dis. 2021 Jan;27(1). doi: 10.3201/2701.203772. Epub 2020 Oct 15.

5. ELISpot COVID to explore the cellular immune response to SARS-CoV-2. Trombert-Paolantoni S., Baer M.E, Litou N., Roquebert B., Lecorche E., Verdurme L., Haim-Boukobza S. poster 0506 ECCMID 2021.

6. Candon S, Guerrot D, Drouot L et al. T cell and antibody response to SARS-CoV-2: experience from a French transplantation and hemodialysys center during the COVID-19 pandemic. Am J Transplant. 2021 Feb;21(2):854-863.

Cerba Research HQ,
Industriepark 3,
9052 Ghent

+32 9 329 23 29
info@cerbaresearch.com
www.cerbaresearch.com