The immune response to coronavirus SARS-CoV-2

To regulate the immune response against a pathogen, the immune system relies on two important mechanisms: the humoral and the cell-mediated immune response.

Laboratory routine diagnostic investigation assess immunity following infection based on the humoral immune response with antibodies against the SARS-CoV-2 virus. Neutralising antibodies can prevent an infection and help to eliminate a pathogen. Not all patients develop measurable levels of antibody after contact with a virus, especially if they are asymptomatic or have very mild symptoms. Further data indicate that after an initial antibody response, the detected antibodies may disappear later.

The cell-mediated immune response and the T cells, in particular, control the strength of the immune response by secreting cytokines to increase or to suppress the immune response depending on the viral load. In addition, T cells mediate the differentiation into plasma cells and the associated subsequent antibody production of the humoral immune response.

T-cell responses thus play a central role in the clearance of viral infections, and T-cell memory can persist for several years to protect against severe reinfection.

The specific detection of reactive T cells (effector cells) against SARS-CoV-2 therefore signals the occurrence of viral contact, either as an acute or a past infection, regardless of whether antibodies were produced or not.

A proven method: The EliSpot assay (Enzyme-linked Immuno-Spot Assay)

The test is able to detect T-cell responses at a single-cell level. The detection of cytokine secretion by T-cells provides a more differentiated view of the immune response, which is a valuable addition to diagnostics.

Cells that have had viral contact respond with activation against specific SARS-CoV antigens applied in vitro. This makes it possible to detect the production and secretion of interleukin 2 (IL-2) and interferon gamma (IFN-γ) using a dual-colour EliSpot-Assay (iSpot).

While effector T cells typically produce IFN-γ, activated memory T cells primarily secrete IL-2. The specific T-cell response is detectable over a longer period than is the case with antibodies.

The SARS-CoV-2 Peptide Mix uses highly specific sequences of immunodominant epitopes of SARS-CoV-2, and the PanCorona Peptide Mix also uses epitopes of endemically circulating corona viruses. This strategy makes it possible to detect cellular basic immunity through cross-reactive T lymphocytes triggered by previous infections.
Possible indication – Questions:

- Has an infection with SARS-CoV-2 occurred at all?
  if a clinical course is mild and asymptomatic,
  if a cross-reactivity with endemically circulating coronaviruses is suspected,
  if a PCR result is negative despite the presence of typical symptoms.

- Uncertain, decreasing, or absent antibody response after PCR positivity.
  Detection of memory T cells that react with cytokine secretion against SARS-CoV-2 antigens in an Elispot assay may indicate previous viral contact without antibody production. Detection of cross-reactivity may indicate baseline immunity independent of antibody detection.

Requirement: SARS CoV-2 Elispot:
  Profile 66911, with indication of clinical information, treatment, etc.
  Price: TP 177.00, no mandatory provision

Material:
  10ml heparin blood

Preanalytics: Due to limited sample stability, the sample must be processed in the laboratory within 24h.
  - Sample preparation daily from Monday to Friday
  - Do not use centrifugation
  - Do not store in the refrigerator
  - Do not expose to direct sunlight
  - Collection via courier, no postal delivery

Tested antigens:
  - PAN-Corona and
  - SARS-CoV-2 peptide pools

Approval: CE, IVD

Result:
The result of the cellular immune response for each tested antigen is expressed as a stimulation index (SI) for IFN-γ and IL-2: The SI is a multiple of the spot counts induced by antigen reaction compared to the negative control.

If the calculated SI is >3 resp. >5, the result is interpreted as reactive, or that reactive T cells against SARS-CoV-2 are detected.

Literature:


