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Information from the Scientific Committee on the Anti-RBD immunoassay

Foreword

This document contains information on the RBD test, offered to UniCA associates as part of health assessments relating to SARS-CoV-2 infection and vaccination against the same virus.

Anti-RBD immunoassay

It is an immunoassay for the quantitative determination, in vitro, of antibodies (including IgG) present in the serum and directed against a portion (Receptor Binding Domain) of a particular protein of the SARS-CoV- 2 called Spike (from its shape). More commonly, this virus structure is referred to as "protein S".

The test is useful for evaluating the circulating antibody immune response against the SARS-CoV-2 protein S.

SARS-CoV-2: An overview of the structure, transmission and detection of virus

SARS-CoV-2, the causative agent of COVID-19 disease, is an enveloped single-stranded RNA BetaCoronavirus. Seven coronaviruses have been identified as agents of human infection, causing illnesses ranging from the mild common cold to severe respiratory failure.

SARS-CoV-2 is mainly transmitted from person to person through respiratory droplets and aerosols. The incubation period from first contact to the development of a detectable viral load in the host commonly ranges from 2 to 14 days. Detection of viral load may be associated with the onset of clinical signs and symptoms, although a substantial percentage of individuals remain asymptomatic or only mildly symptomatic. The interval during which an individual with COVID-19 is infectious has not yet been clearly established (it should range from two days before to a few days after the development of symptoms). Transmission of the virus by presymptomatic and/or asymptomatic individuals is well known.

The coronavirus genome encodes 4 main structural proteins: spike (S), envelope (E), membrane (M) and nucleocapsid (N). Protein S is a very large transmembrane protein that assembles into trimers to form the characteristic surface spines of coronaviruses. Each S monomer consists of an N-terminal S1 subunit and an S2 subunit closest to the viral membrane. The virus enters the host cell through binding of protein S to the angiotensin-converting enzyme 2 (ACE2) receptor, which is present on the surface of numerous cell types, including alveolar type II lung cells and epithelial cells of the oral mucosa. Mechanistically, ACE2 is engaged by the Receptor Binding Domain (RBD) on the S1 subunit.

In the case of SARS-CoV-2 infection, the host usually develops an immune response against the virus, which typically includes the production of specific antibodies against various viral

antigens. IgM and IgG antibodies to SARS-CoV-2 appear to occur almost simultaneously in the blood. There is a significant inter-individual difference in the levels and chronological appearance of antibodies in COVID-19 patients, but median seroconversion is observed approximately two weeks after infection.

After infection, or after vaccination, the binding strength of antibodies to viral antigens increases over time, a process called affinity maturation. High affinity antibodies can neutralize the virus by recognizing and binding specific viral portions (called epitopes). Antibodies to SARS-CoV-2 with strong neutralizing capacity have been identified, particularly potent when directed against RBD.

What does it mean if the test is positive?

It means that the person has contracted the virus or has been vaccinated (or both).

If the test is positive (in an unvaccinated person), can this person be infectious?

Probably not, because antibodies are generally detectable after two weeks of infection; however, certainty can only be achieved by carrying out a molecular test (which should be negative).

What does it mean if the test is negative?

It means that the person has not contracted the virus or has not been vaccinated (or that these events are so distant in time - a year or more - that the circulating antibodies may have disappeared).