Monoclonal antibodies for the S2 subunit of spike of SARS-CoV-1 cross-react with the newly-emerged SARSCoV-2

Wednesday, 22 Jul 2020

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ABSTRACT

A novel coronavirus, SARS-CoV-2, which emerged at the end of 2019 and causes COVID-19, has resulted in worldwide human infections. While genetically distinct, SARS-CoV-1, the aetiological agent responsible for an outbreak of severe acute respiratory syndrome (SARS) in 2002–2003, utilises the same host cell receptor as SARS-CoV-2 for entry: angiotensin-converting enzyme 2 (ACE2). Parts of the SARS-CoV-1 spike glycoprotein (S protein), which interacts with ACE2, appear conserved in SARS-CoV-2. Aim: The cross-reactivity with SARS-CoV-2 of monoclonal antibodies (mAbs) previously generated against the S protein of SARS-CoV-1 was assessed. Methods: The SARS-CoV-2 S protein sequence was aligned to those of SARS-CoV-1, Middle East respiratory syndrome (MERS) and common-cold coronaviruses. Abilities of mAbs generated against SARS-CoV-1 S protein to bind SARS-CoV-2 or its S protein were tested with SARS-CoV-2 infected cells as well as cells expressing either the full length protein or a fragment of its S2 subunit. Quantitative ELISA was also performed to compare binding of mAbs to recombinant S protein. Results: An immunogenic domain in the S2 subunit of SARS-CoV-1 S protein is highly conserved in SARS-CoV-2 but not in MERS and human common-cold coronaviruses. Four murine mAbs raised against this immunogenic
fragment could recognise SARS-CoV-2 S protein expressed in mammalian cell lines. In particular, mAb 1A9 was demonstrated to detect S protein in SARS-CoV-2- infected cells and is suitable for use in a sandwich ELISA format. Conclusion: The cross-reactive mAbs may serve as useful tools for SARS-CoV-2 research and for the development of diagnostic assays for COVID-19.

FIGURE

A. Antibodies expected to target SARS-CoV-2 S protein, (A) hybridise to the denatured protein in western blot, (B) bind to the protein in ELISA and (C) recognise cells expressing the protein as shown by immunofluorescence.

FIGURE LEGEND

Antibodies expected to target SARS-CoV-2 S protein, (A) hybridise to the denatured protein in western blot, (B) bind to the protein in ELISA and (C) recognise cells expressing the protein as shown by immunofluorescence.