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

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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 SARSCoV-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 SARSCoV-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

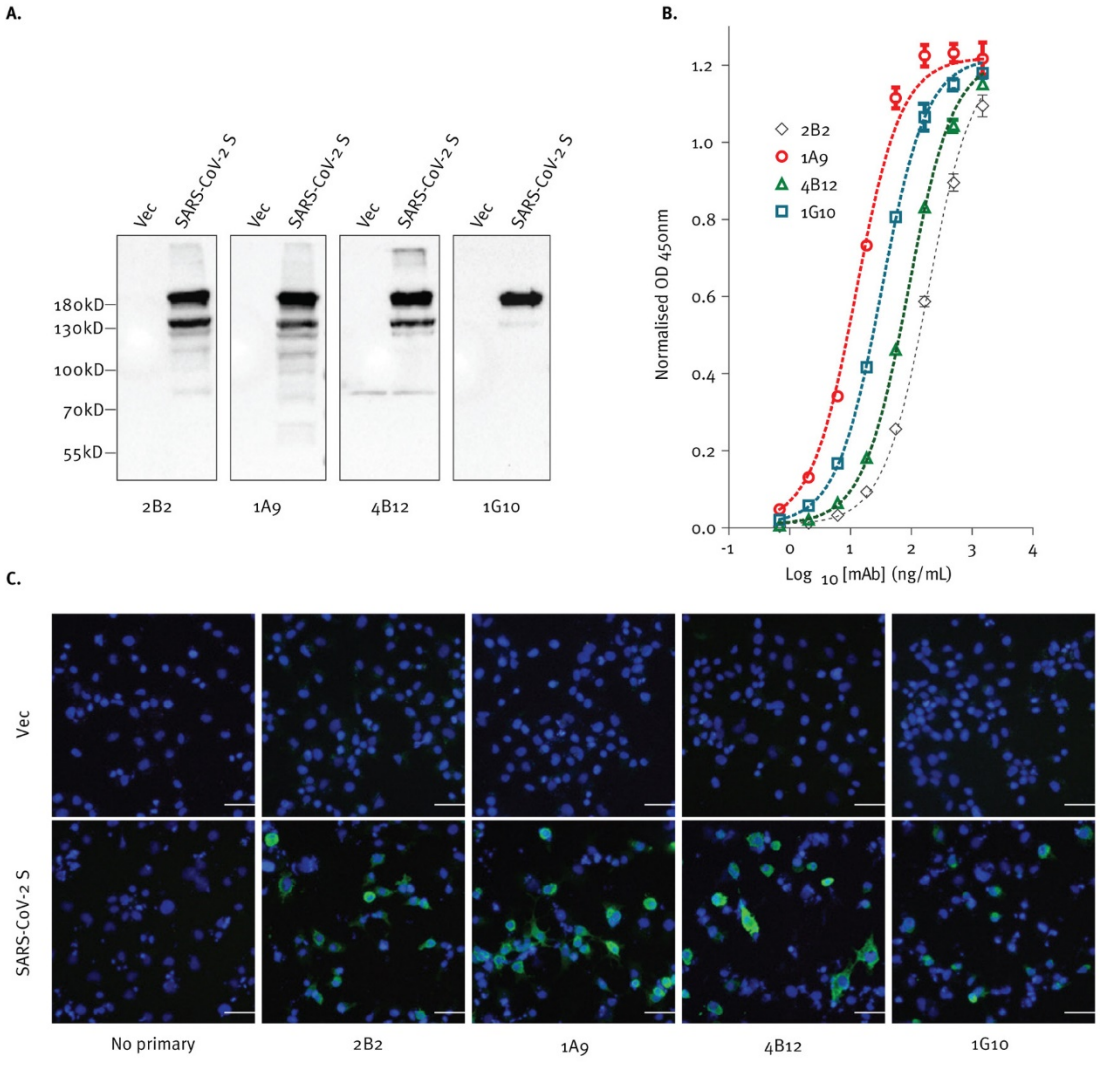

FIGURE LEGEND

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.